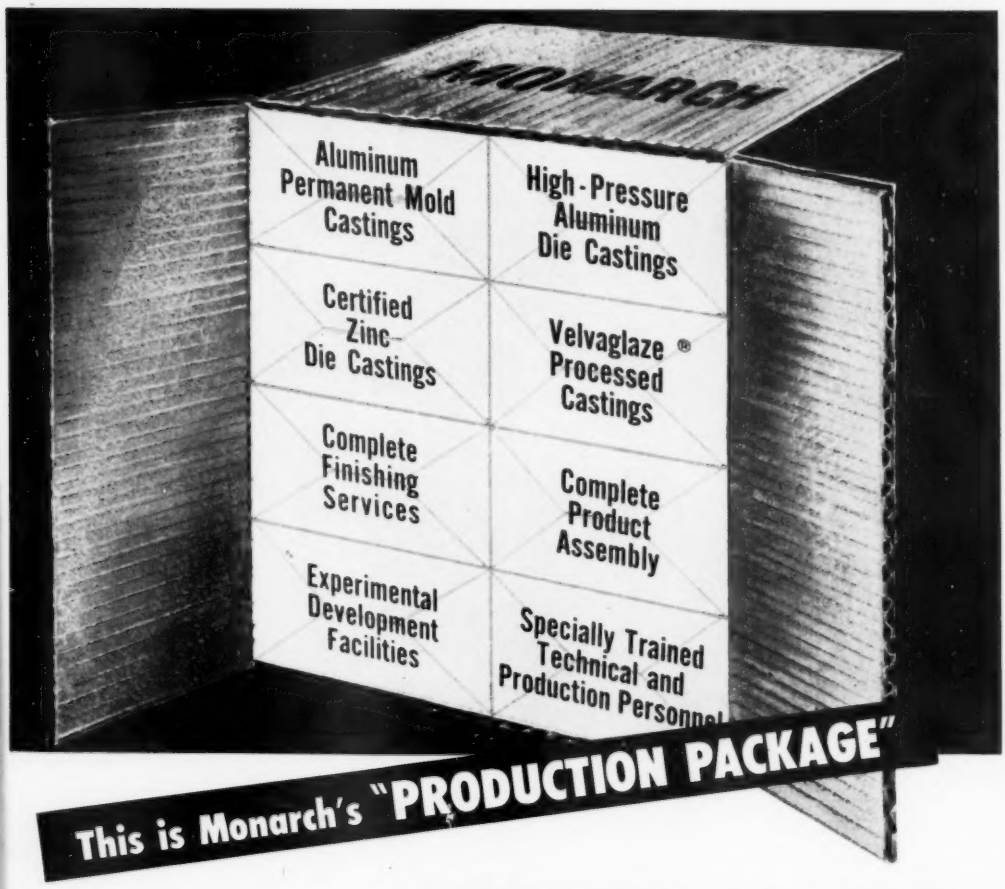
PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

DESIGN • MANUFACTURE • FINISHING • USE



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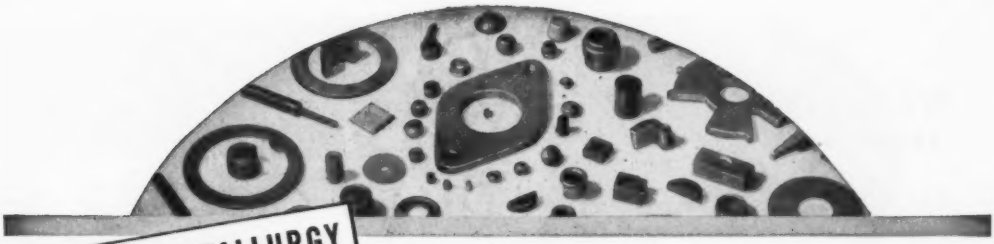

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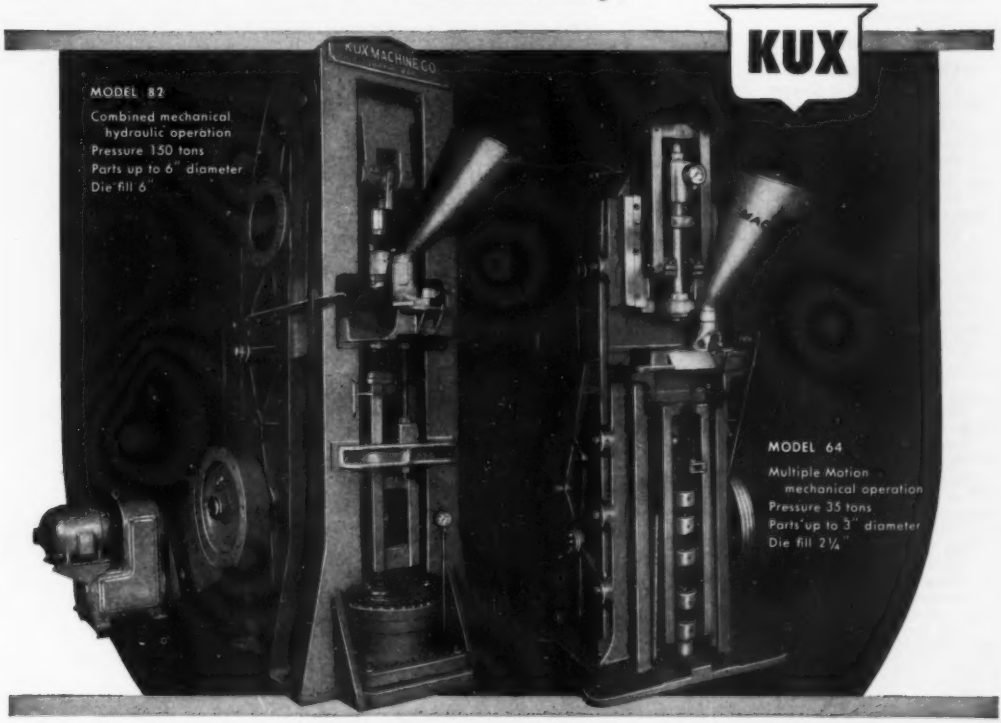

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MAY 1952
Vol. 10 No. 5

PRECISION METAL MOLDING

DIE CASTINGS • INVESTMENT CASTINGS • POWDER METALLURGY
PERMANENT MOLD CASTINGS • PLASTER MOLD CASTINGS

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LETTERS TO THE EDITOR

WANTED: DIE CAST CORE FOR DRAPERY CORD PULL

There is a die casting made that is a core for a drapery cord pull. The die casting is somewhat barrel-shaped and has an injection-molded plastic coating over the die cast part.

We are interested in contacting the company that makes this die casting and are writing to ascertain whether or not you can give us the name of the company that produces this die casting.—F.J.K.

COATING FOR NON-CONDUCTIVE CASTINGS

In your March issue I note an article on electroforming by A. C. Buschow. I would like to know what materials are used to coat non-conductive castings to be electroplated.—E.B.C.

In some instances, flake graphite applied to the surface will furnish such a coating, while in others, a very thin coating of a conducting metal applied by metallizing will do the job.

The Mealey Grease and Oil Co. of Cleveland produces a special type graphited grease compound used for coating non-conducting patterns for use with an electronic duplicator in machining die cavities.—Ed.

ALUMINUM COLORING TECHNIQUE

We are interested in the Aluminum Coloring Technique referred to in your March issue and would like to obtain any information available to enable the coloring of Aluminum die-cast fishing rod handles. Our handles are made from QQA 591 C1 10 Aluminum Alloy.—S.W.

There has been considerable interest in this process an-

continued on page 6

aircraft component steel parts made from

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The pictured castings are currently being used to produce such important aircraft accessories as fuel injectors and regulators, carburetors, landing gear door latch mechanisms, rocket release mechanisms and radar equipment. Cast to close tolerances with smooth surface finish, expensive machining operations are avoided—resulting in saving of valuable time, reduction in cost and eliminating the need for hard-to-get machine tools. Also *Accumet Precision Investment Castings* permit the use of higher alloyed steels that are difficult or impossible to machine or forge, thus increasing the life or performance of the component parts.

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Old brush holder designed by General Electric for use on aircraft generators.

New brush holder designed in collaboration with Atlantic engineers and produced by the Plaster Mold Process.

WRITE for a copy of "Quality Precision Castings for Industry" on your Company letterhead. This booklet explains how the plaster mold process cuts production costs, and includes specifications on Atlantic's alloys.

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LETTERS TO THE EDITOR
continued from page 4

nounced by Enthone, Inc. Information has been forwarded in each case.—Ed.

COPIES OF IRON POWDER ARTICLE

Would you please forward to us at your earliest convenience —attention of the writer—three or four copies of the article "IRON POWDER: a non-allocated metal", as appeared in January issue of Precision Metal Molding. We found the copy forwarded to us quite interesting.—J.F.B.

That was the first of five articles on iron powder, its availability, applications and properties. The final article of this series appears in this issue, describing the application of high density iron powder parts.—Ed.

SOURCE FOR LOST WAX CASTINGS

On page 10 of the March issue is a request for plaster mold casting source sent in to you for information. We are trying to locate a source on lost wax method and would appreciate receiving any information on this process you might care to forward to us.—D.B.

Information forwarded.—Ed.

PLATING ON ALUMINUM DIE CASTINGS

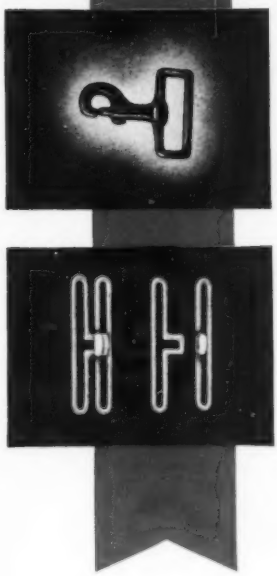
We have been referred to you for an article which appeared in Die Castings magazine, in June 1951 relating to the chromium plating of aluminum. We have been told that it contains some useful information along lines of work we are now doing.—M.E.

The article on preparation of aluminum surfaces for plating by a special wet abrasive blast technique has been forwarded. —Ed.

Army Engineers Find....

Z = QUALITY

IN ZINC ALLOY DIE CASTINGS



Top-quality equipment for America's fighting men is of prime importance to Army Engineers. Because each component must meet exacting specifications, these men know they can depend on zinc-base die castings which carry the stamp of approval of the American Die Casting Institute's Certified Zinc Alloy Plan.

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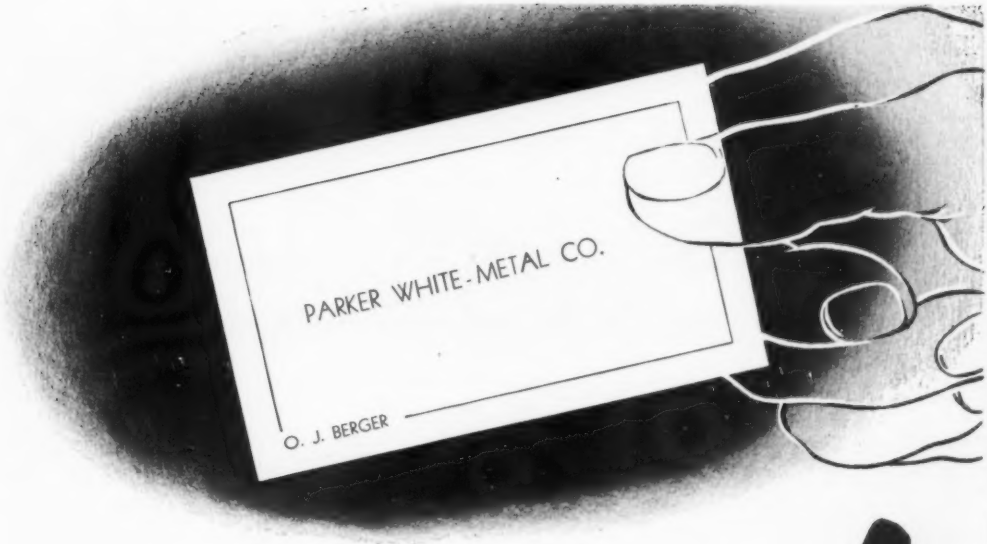

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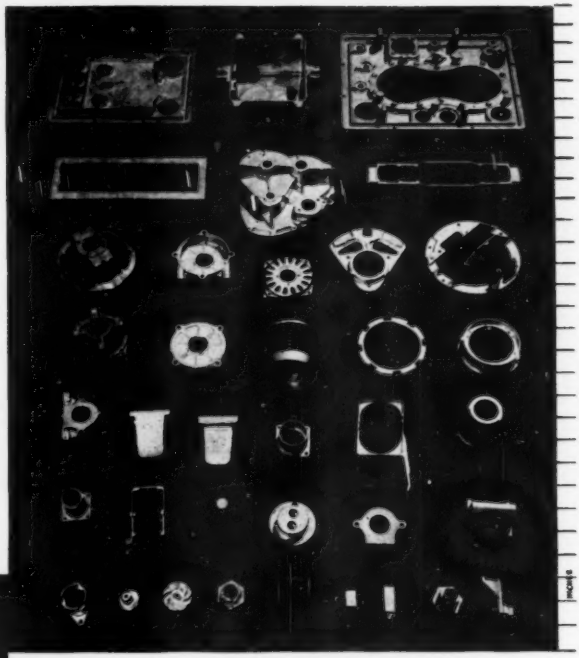

Dollin Castings for Defense Work

The castings shown at right were produced by Dollin for defense order prime contractors. Dollin has long been supplying die castings to many of the country's leading manufacturers for both commercial and defense work. Dollin's facilities for making larger castings are modern, extensive—include many die casting machines designed by Dollin Engineers for superior operating efficiency.

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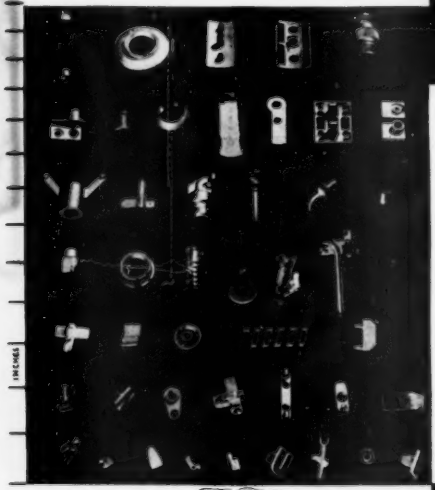
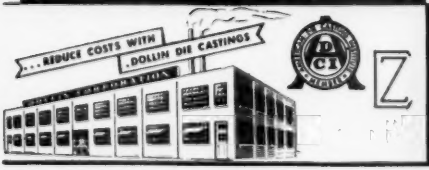


Parts from Dollin's Special Small Castings Department

Specialized automatic equipment enables Dollin to produce simple or *intricate* small castings at *high speed*. The complexity of the parts shown—made for both defense and commercial applications—indicates the machining and assembly savings that this special equipment makes possible. More and more manufacturers are utilizing its combination of abilities—intricacy, accuracy, fast production—to improve designs and reduce costs.

Send Prints for Quotation or Write for Small Castings Dept. Bulletin plus Samples



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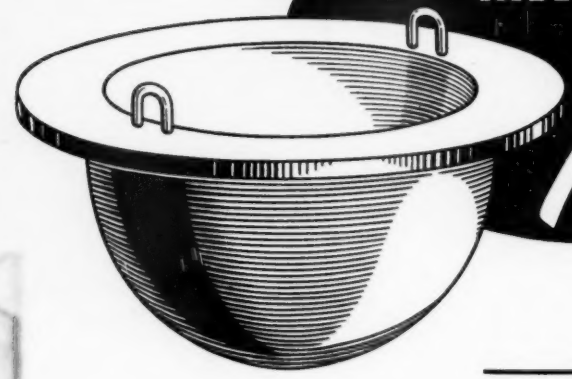

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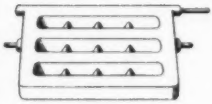

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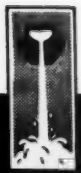

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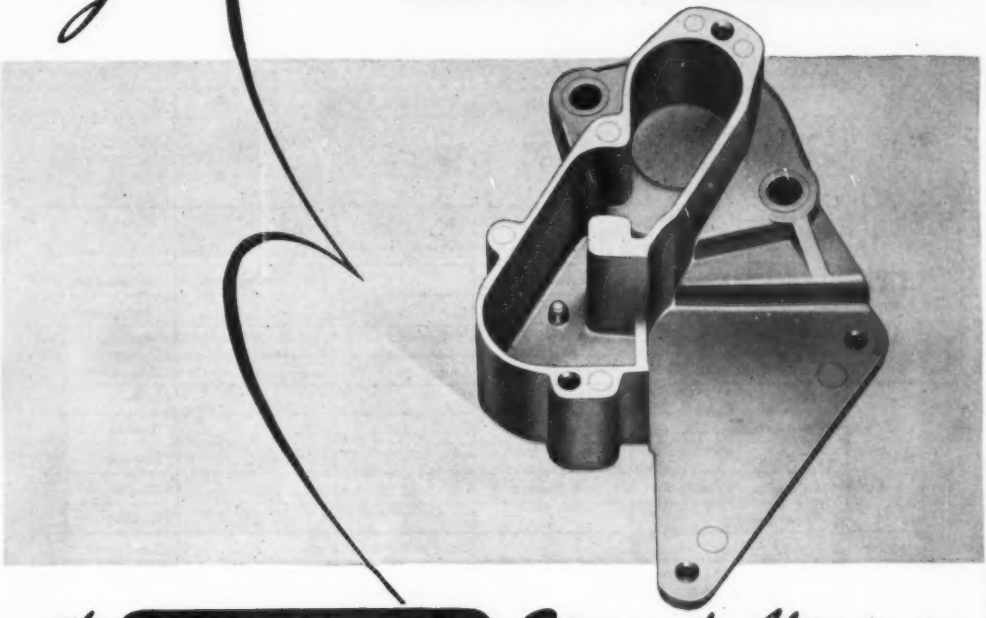

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Selection Factor in Choosing Alloys for Die Castings

		Aluminum Alloys ASTM Nos. S5, SC2	Brass	Magnesium Alloys ASTM Nos. 12 and 13	Zinc Alloys ASTM Nos. 21, 23, 25
Mechanical Properties	Tensile strength	3	1 (Strongest)	3	2
	Impact strength	3	1 (Toughest)	3	2
	Elongation	4	1 (Most ductile)	3	2
	Dimensional stability	2	1 (Most stable)	3	3[a]
	Resistance to cold flow	2	1 (Most resistant)	2	3
	Brinell hardness	3	1 (Hardest)	3	2
Physical Constants	Electrical conductivity	1 (Highest)	2	3	2
	Thermal conductivity	1 (Highest)	2	4	3
	Melting point	2	1 (Highest)	2	3
	Weight, per Cu in.	2	4	1 (Lightest)	3
Casting Characteristics	Ease, speed of casting	2	3	2	1 (Easiest)
	Maximum feasible size	1 (Largest feasible)	2	1 (Largest feasible)	1 (Largest feasible)
	Complexity of shape	1 (Greatest possible)	2	1 (Greatest possible)	1 (Greatest possible)
	Dimensional accuracy	2	3	2	1 (Most accurate)
	Minimum section thickness	2	3	2	1 (Thinnest)
	Surface smoothness	2	3	2	1 (Smoothest)
Cost	Die cost[b]	2	3	2	1 (Lowest)
	Production cost	2	3	2	1 (Lowest)
	Machining cost	2	3	1 (Lowest)	1 (Lowest)
	Finishing cost[c]	3	2	3	1 (Lowest)
	Cost per piece[d]	2	3	2	1 (Lowest)
Extent of Use		2	4	3	1 (Most used)

Source: Materials & Methods

[a] *Through the use of a low temperature annealing treatment, Alloy No. 23 can be made virtually stable in dimensions.*

[b] *Dies for casting the low melting point alloys are least expensive and have longest life.*

[c] *Includes polishing and buffing expense as well as ease of applying all types of commercial finishes, both electrodeposited and organic.*

[d] *Based on die, material and fuel costs, production speed, machining and finishing costs.*

ZINC is the most adaptable metal for the die casting process and provides the best combination of physical and chemical properties. Zinc die castings are stable, strong, and can be cast to close tolerances; they are easily machined and a large variety of beautiful metallic and organic finishes can be readily applied to the castings. Industry's recognition of these factors is indicated by a two-hundred-fold increase in the use of zinc die castings in the last ten years, plus the fact that nearly 70% of *all* die castings by weight are made of zinc.

DIE CASTING is the Process • ZINC, the Metal • BUNKER HILL, the Preferred Zinc

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DIE CASTING cuts costs 66⅔%

CASE HISTORIES FROM MT. VERNON FILES

Seeking to lower manufacturing costs without any sacrifice of product quality, Jaen Electromotive Corporation, of Long Island City, N. Y. gave die casting a chance to solve the problem of producing gear-train housings for synchronous motors. Previously, such housings had been sand cast.

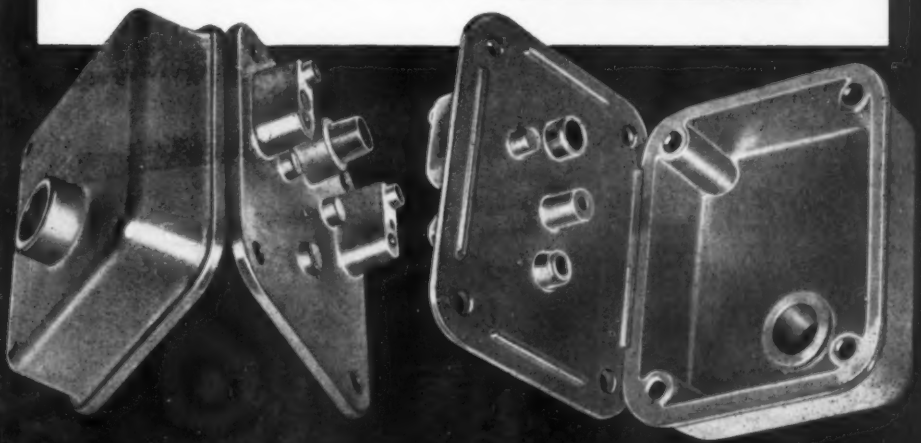
The result of the experiment is that Jaen *now specifies die casting*. For it has found: (1) the "clean" die castings produced by Mount Vernon cut machining costs over 50%; (2) an etched name-plate can be eliminated, since die casting permits company name and motor specifications to be clearly cast into the housing; (3) over-all appearance of the die cast units is decidedly superior.

Added to these advantages, are those realized *on the spot*, as the casting is made. Namely, *extremely fast production*, since die cast items are produced virtually in one operation, as the die closes; and *savings in material*.

Says Jaen Electromotive Corporation: "The over-all cost of the die castings is only *one-third* that of the machined sand cast aluminum pieces initially used. We shall be able to reduce our list price on this type of unit, and increase sales appreciably."

The next time *you* have to select a manufacturing procedure, remember this example of remarkable savings made possible by die casting — and consult with us. We shall welcome the opportunity to help you increase your output, improve your products, and *hold down your production costs*.

MT. VERNON DIE CASTING CORP.
MT. VERNON NEW YORK



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1. Furnace with hood open.

2. Furnace with hood open for dipping.

3 Furnace with opening and trough for hot charging.

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These furnaces were designed to meet the demands of the industry for faster, more efficient and most economical magnesium melting. Their engineering incorporates many exclusive features. They come complete with sulfur dome and hood. Provisions for hot charging through hood and dome are included. They are excellent furnaces for permanent mold, die casting and sand casting operations. The hoods provide ample venting for the gases of combustion, sulfur and fluxing fumes. They come complete with blowers and choice of oil or gas fire. Automatic controls are also available if desired. Capacities: 250- 350- 600- 800- 1200- 1600-pounds.

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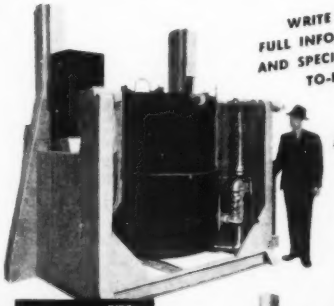
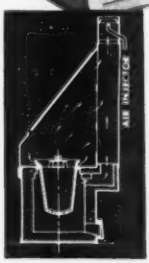
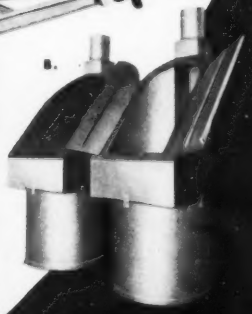


A.





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A. Hydraulic Tilt Magnesium and Aluminum melting furnace handling from 500 to 3000 lbs. of aluminum. Incorporates the famous Stroman Stationary Lip Pour, which creates a constant pouring arc at any desired pouring speed. Saves time and metal. These furnaces may be so arranged in series so that several may be operated from one hydraulic pump unit.

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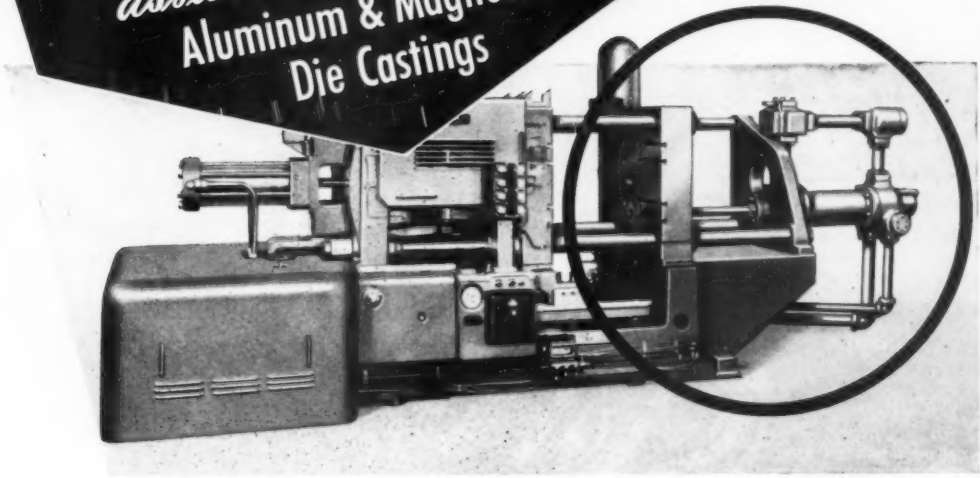
New Reed-Prentice Process assures Higher Quality Aluminum & Magnesium Die Castings

Reed-Prentice #2G "Cold Chamber" Die Casting Machine with New Pre-fill Attachment.

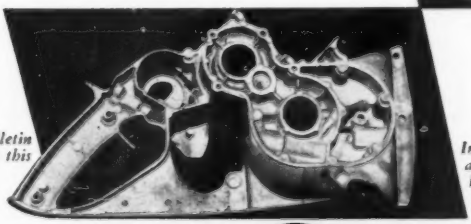


- By its constant in-the-field research, Reed-Prentice has developed a special die casting process that produces higher quality aluminum and magnesium parts faster — more economically — and more efficiently.

Through a new prefill arrangement and much faster "shot" plunger speed — up to 10,000 inches per minute — Reed-Prentice Models 1½G and 2G "Cold Chamber" Machines now offer even greater advantages in die casting aluminum and magnesium.

Two 8-inch Patio Furniture Wheels Die Cast of Aluminum on Reed-Prentice #1½G Machine by W. L. Chapman Co., Pasadena, Calif. Complete shot weighs 3½ lbs. and has projected area of 103 sq. in.

Write Dept. A for new bulletin giving complete details on this important die casting development.



Intricate Magnesium Body for Portable Chain Saw produced on Reed-Prentice #2G Die Casting Machine by McCulloch Motors, Los Angeles, Calif., weighs 2½ lbs.

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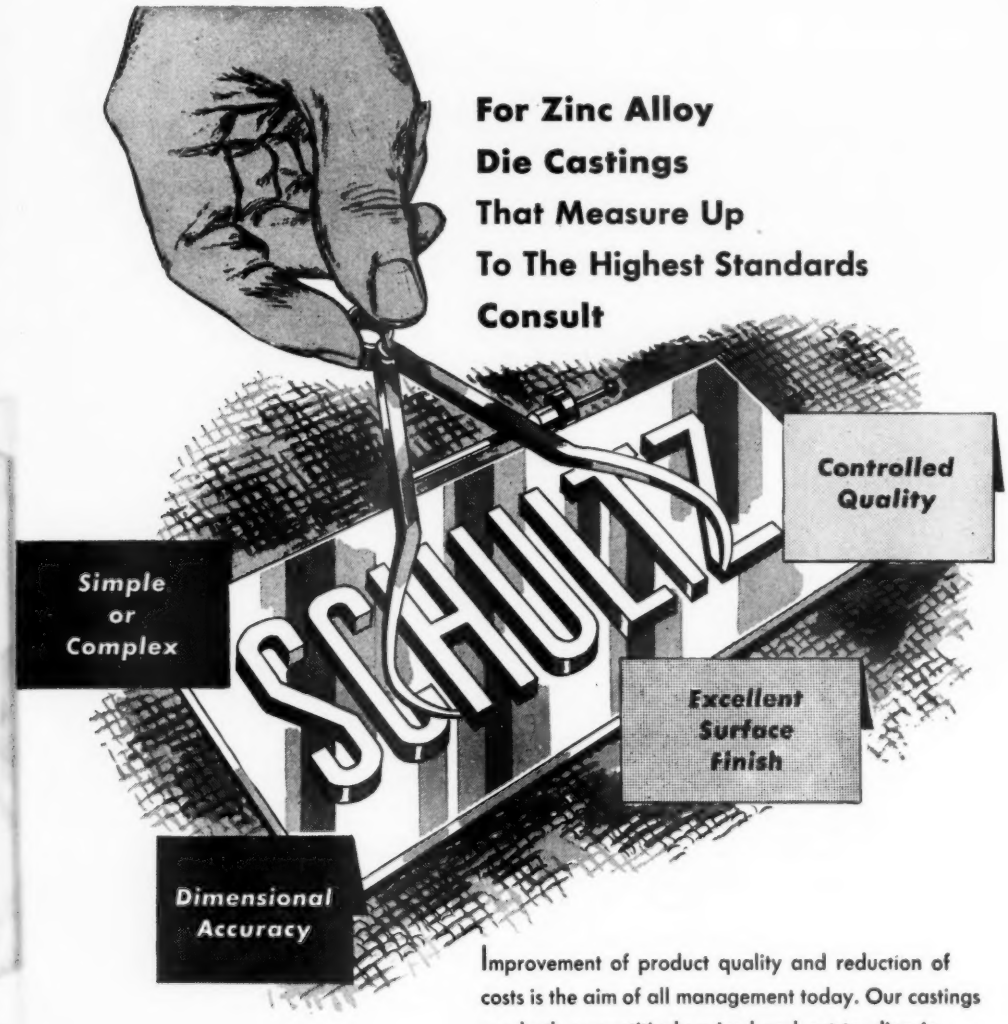

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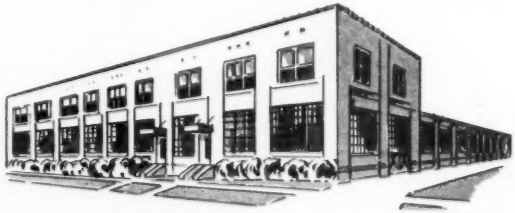

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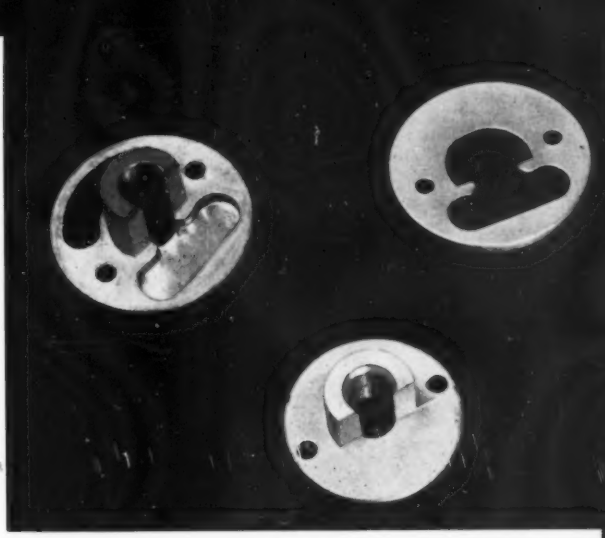


UNITARY CONSTRUCTION of the die casting, top left, has been substituted for a built-up assembly of parts shown at right.

A DIE CASTING replaces a 2-piece assembly and cuts costs by 76 per cent

AMONG the other problems that beset a manufacturer is that of inventory. Regardless of the complexity or simplicity of a machine, there must be some stocking of component parts. Any reduction in this inventory is, automatically, dollars in the pocket. When reduction of inventory can be combined with a decrease in actual manufacturing cost, the savings can become an important item.

The die cast wheel bushing used by the Durant Mfg. Co. of Milwaukee, in their cycle counters has enabled that company to show both a manufacturing economy and a 50 percent inventory reduction.

The original wheel bushing was an assembly of two parts, a brass washer-like stamping and an aluminum hub section machined from bar stock. *Manufacture of both of these parts was accompanied by a very considerable scrap loss, particularly the hub section which was machined from bar stock and showed a 60 percent scrap loss.* A further complication in manufacturing, and another scrap loss, arose from the need for two different hub lengths. Assembly was made by pressing the stamped brass plate onto the proper hub and then riveting the two parts together. This necessitated the stocking of three components and the rivets.

In order to reduce inventory and lower manufacturing costs, the part was converted to an aluminum die casting. By using a casting, it was possible to produce a complete bushing in one piece. The two different hub lengths are secured by simply putting an insert into the die when it is desired to make the shorter hub.

No design changes in the bushing were necessary when conversion to a die casting was made and the foundry, the Serv-all Die Casting Co. of Crystal Lake, Ill., was able to maintain all dimensional tolerances within original drawing specifications; that is, specifications for the original machined part. Concentricity relationship between the bore, hub diameter, and outside diameter was the most difficult to hold but the die caster has been able to maintain this concentricity to within 0.002 TIR.

Inventory savings are almost impossible to determine, though they are known to be very considerable. *Actual manufacturing costs have, however, been materially cut so that the finished die cast bushing now costs 76 percent less than the former assembly.*

Finishing of the die cast bushing is simple. A standard dichromate treatment is now used and gives adequate corrosion protection. Such a finish was formerly impossible to apply since the assembled part could not adequately be cleaned for treatment after assembly and finishing before assembly gave an incomplete job.

1. **WEARING QUALITIES OF TOOL STEEL** can be incorporated into these irregularly shaped small components for strapping, stitching and tensioning tools by means of the investment casting process. These parts cost less than would be possible by any combination of machining, forming and assembling.

Tool Steel INVESTMENT CASTINGS meet physical requirements of strapping tools

THE number of places where Acme Steel Company of Chicago has been able to utilize investment castings, principally in tool steel alloys, has been growing during the past few years. The prospect is that this trend will continue wherever small, irregularly-shaped pieces need to be made of stress- or abrasion-resistant materials.

Acme Steel has found both serviceability and economy in the four small investment castings illustrated and described here. These parts are subjected to various types of service conditions which make it essential that toughness and hardness be provided. They are also, in general, close dimensioned.

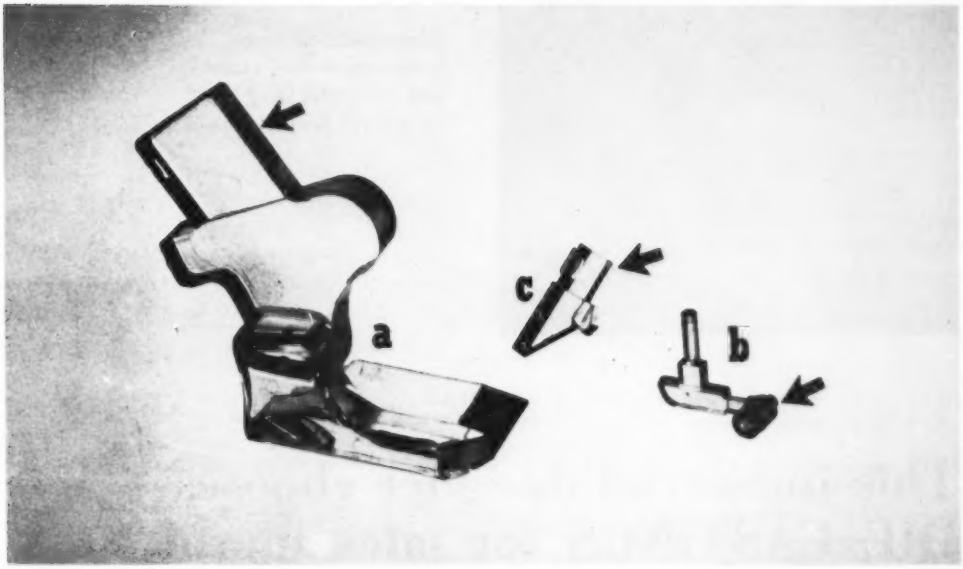
Two contract facilities produce these investment castings using molded polystyrene patterns.

Critical parallel and perpendicular relationships

The strap seat for a pneumatic stretcher, Figure 1a, has been produced as an investment casting since 1949. It is cast in Carpenter Solar tool steel and heat treated to Rockwell C 50-55.

Thickness of the upright portion of this casting is critical because it fits into a close tolerance slot in the machine. Tolerance on parallelism between its two sides is specified at .002 per inch. This is met by grinding each side of the castng.

However, perpendicular relationship between the upright portion and the underside of the base is also specified at .002 per inch, and this cannot readily be attained in the casting due to the necessity of providing draft. Acme Steel



2. **POLYSTYRENE PATTERNS ARE USED for the castings shown in Figure 1. Note the large size sprue provided to prevent cavitation. Draft allowances to permit ejection of the molded plastic, and radius specifications to relieve shrinkage cracking at intersecting planes, have been provided by the designers.**

machines the base of the casting, using one of the vertical surfaces of the casting for locating in the fixture.

Because of the critical need for squareness, all holes are drilled into this casting. Black oxide plating is applied as a corrosion inhibitor.

The steel strapping that is tensioned by this equipment is pulled across the beveled surface of the casting. At the point of greatest wear, a special, adjustable insert is screwed into the casting, but there is also considerable abrasive action on the surface of the casting. The particular need for squareness specifications in this casting arises from the importance of having a full surface contact rather than a point contact with the steel strapping as it passes across the casting.

Draft allowance on the molded polystyrene pattern is similar to that for die castings and must be considered in setting up dimensional specifications.

Also to be considered are problems of shrinkage of the pattern material. For example, it was necessary to increase the radius somewhat between the intersecting vertical and horizontal planes of the casting to overcome shrinkage cracking. It has been found advisable to allow at least 1/64 inch radius wherever possible to avoid notch effect. This is most pronounced between sections having dissimilar thickness.

It is apparent from the polystyrene pattern shown in Figure 2a, that an exceptionally large sprue has been provided to feed the pattern so that sufficient head of material would be present to prevent cavitation.

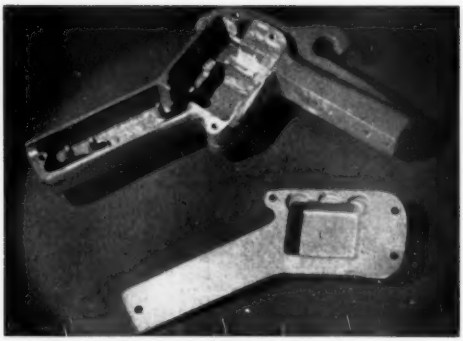
Designer sometimes specifies sprue and parting line location

Generally, the supplier is allowed to determine the sprue and parting line location, but sometimes the location of a parting line must be kept away from an important surface, or the sprue must be confined to a specified area for finish or dimensional reasons. When this is true, the designer needs to specify this information on his drawings for the guidance of the investment caster.

This has been done in the design of the small sealer bridge, Figure 1b, used in a Steelstrapper manufactured by Acme Steel. The piece is investment cast in Red Star tungsten tool steel.

Bottom surfaces of the sealer bridge come into contact with the Steelstrap being fed into the mechanism. The small nib on the bottom surface engages a hole in the seal and holds it firmly

continued on page 85



These sand castings were expensive, clumsy and rough-looking; they have been replaced by . . .

This industrial designer chooses DIE CASTINGS for sales appeal and manufacturing economy

By ALBERT M. SANDERS
Allen-Stevens Corp.
Jamaica 2, New York

THERE is much that prospective users of die castings will find of interest in the unusual methods that were applied when the Allen-Stevens Corp. undertook the die casting of a housing for a new type of self-contained portable spray unit.

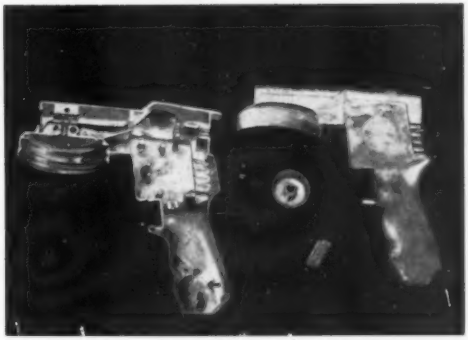
The Champion Implement Co., 45 W. 45th Street, New York, which had developed a radically different type of spray gun, found that they were hampered by inefficient methods of production, resulting mainly from the use of a sand cast aluminum housing. Their product, despite its advantages over other spraying devices, could not be priced sufficienty low to produce a satisfactory volume of sales.

Their appliance, as finally developed, is a portable, hand-held gun, incorporating a jar of the material to be sprayed, and a pump and motor in the body, ready to be plugged into any convenient outlet. The pump consists of a stainless steel centerless ground rod which, reciprocating within a carefully reamed bronze cylinder, draws liquid up a tube from the jar, thru a ball check valve, and propells it out the nozzle, where it breaks into an atomized spray.

The stainless steel rod is driven by a vibrating armature, in turn acted upon by the magnetic field of a coil. The coil is energized when the built-in trigger switch is closed.

This entire mechanism was contained within a housing made from a deep, solid heavily machined casting, and a flat cast cover. The housing also served to hold all the above working elements in accurate juxtaposition. It was here that the production difficulties arose.

These difficulties resulted from the necessarily elaborate machining of the sand castings, involving much precision milling, and reaming, to provide the recesses, locating lugs and bosses, screw holes and shaft holes. Furthermore, a considerable percentage of the castings were shown to be defective only after expensive machining revealed blowholes. And all too often, a slight error in tool set-



. . . die castings that are light, strong, attractive and need little machining . . .

ting resulted in one incorrect dimension and an entire housing was ruined.

In addition, from the point of view of appearance, the relatively thick sections required in the design of sand castings produced a housing which was extremely clumsy and heavy yet not at all impressive. Nor did it impart to the prospective purchaser a feeling of modernity, workability or comfort. The sand cast finish was rough and unpleasant and a cheerless black wrinkle finish was chosen as the best way of diverting attention from the surface defects.

When Champion realized that in addition to all the above deficiencies, they had also tied up a great deal of capital in a large battery of machine tools, they decided to investigate methods of precision molding which would eliminate the machining then required.

Plastic molding was rejected for reasons of durability and because a main advertising point was the "all-metal" construction of the gun. This narrowed the field to die casting. Mainly because of a low mold cost and fast delivery (both of which resulted from new methods of tooling to be described), the Allen-Stevens Corp. was given the assignment of translating the housing into die cast form.

Before proceeding with the mold design, however, it was determined that the change in process should be used as an opportunity to completely revamp the external appearance of the gun. A firm of industrial designers, Edward C. Morris, was engaged, and after several preliminary efforts, in which engineers of the die casting company worked closely with them to make sure that the requirements and advantages of die casting would be properly considered, an acceptable design was submitted.

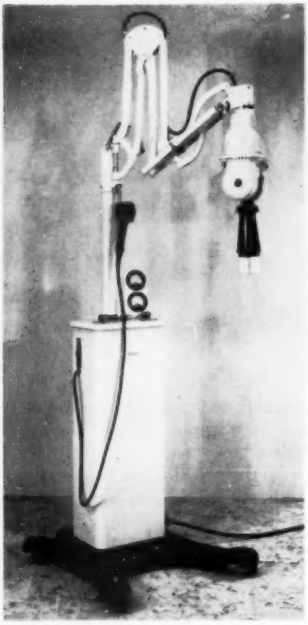
It took full advantage of the thin sections possible in zinc alloy die casting to "blow-up" the housing and at the same time reduce the weight. The design chosen gives an impression of sturdiness and a generally businesslike quality, producing at the same time a feeling of portability and ease of use. The blown-up housing is far more impressive than the previous design, and the choice of planes and lines makes the gun seem to be "leaning into" its work and at

continued on page 82

Rapid, Low-Cost Die-Making Uses Investment Casting

The technique for producing these die casting dies involves an interesting application of investment casting to produce the cavity. For details, see pages 82-84.

. . . . . to produce this spray gun.



Folding cantilever arm assembled from PERMANENT MOLD CASTINGS

NUMEROUS attempts have been made to define the break point where it becomes more economical to use a permanent mold casting instead of a sand casting and also when to use a die casting rather than a permanent mold casting.

While figures can be quoted, which place arbitrary upper and lower limits on the numbers of pieces that can or should fall into the permanent mold casting field, there are such a multiplicity of other factors to consider that a single count of pieces per year is generally deceiving.

The final surface finish desired and the cost of achieving it for each of the different casting methods must be considered. The number of machine operations that can be eliminated by using a different casting method is a major influencing factor and finally the type and complexity of coring will all help to make the final decision.

The permanent mold castings used by the Ritter Co., of Rochester, N. Y., in their dental operating room equipment illustrate, quite admirably, how these factors influence the choice of casting methods.

The folding bracket used to support the X-ray tube makes use of several permanent mold castings as indicated. All of these parts could be fabricated by any of the three methods mentioned above.

The number of parts involved is, in this case, sufficiently great so that the cost of a permanent mold can be justified. In addition, the improved surface secured by permanent mold casting lowers the finishing cost on the individual pieces so that a further economy is secured. None of these parts is intricately cored, though advantage is taken of the accuracy of hole location to core many of the smaller pivot holes.

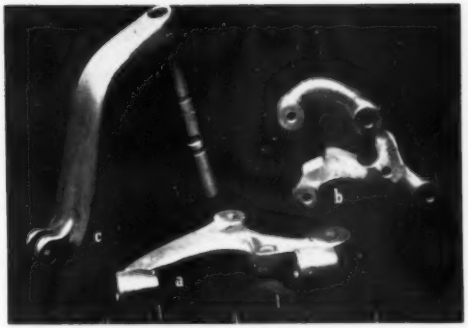
The size and shape of the parts is such that die casting might advantageously be used. However, the number of parts of a given design is not great enough to justify the higher die costs. The improved surface finish which would result from the use of die castings would not lower finishing costs sufficiently to be a controlling factor nor is the greater accuracy that is achievable needed.

Consideration of all of these factors made permanent mold casting the most economical fabricating method for the Ritter Co.

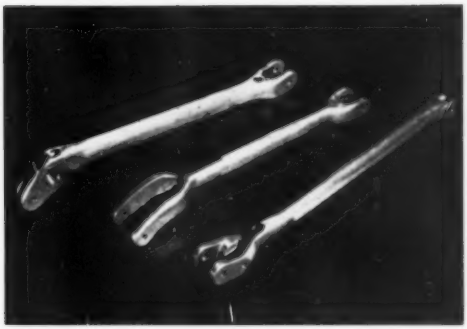
Cantilevered load stresses met by support bracket

In the X-ray unit support bracket, Figure 1a, strength and rigidity are the prime requirements. The lead shielding and metal case of the X-ray tube make it a relatively heavy assembly. When, therefore, the folding bracket is fully extended, there is a very considerable stress set up in the bracket due to the heavy load at the end of the long cantilever beam.

The entire bracket assembly must operate smoothly and easily so that the tube can be posi-



1. **LIGHT WEIGHT, adequate strength, and complex coring are illustrated in these permanent mold castings. High dimensional accuracy and good surface finish contribute to low cost manufacturing.**



2. **ALL SORTS OF INSERTS can be utilized in permanent mold castings. Here two of the three support arms have copper conduits for an X-ray cable cast in.**

tioned quickly and without danger to the patient. To secure the required ease of operation, all pivots and the two main swivels must be held to rather close dimensional tolerances. In most cases, the allowable variation is ± 0.0015 or less. Since these tolerances are much closer than can be cast, most of the holes are only indexed in the casting operation. Finishing operations include both drilling and reaming of these holes, as well as surfacing of all pivot bosses.

The surface finishing of this part is the same on all of the castings and will be described later.

Copper conduit cast as insert

The folding bracket for the X-ray tube support has four major arm members. Three of these are illustrated in Figure 2. As in the case of the main support, smoothness of operation and adequate rigidity are essential.

Aluminum permanent mold castings are used with very large yoke faces to secure adequate bearing surfaces. The width of the yoke is held to ± 0.0025 as are the mating bosses with a maximum clearance between the boss and yoke face of about 0.030 to allow for the thickness of the enamel used for finishing.

Two of the arms carry cast-in copper tubes which act as conduits for the power cable. Since there is some movement of the cable as the bracket is extended or folded, a smooth surface for of a copper tube conduit rather the cable to slide on must be provided. This accounts for the use than simply coring the casting.

The large hole in the one arm is cored and then reamed in the final machining. All other pivot holes are indexed only in the rough casting.

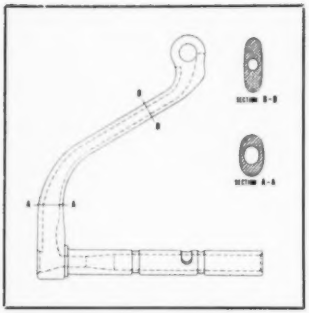
To secure the ease of operation and smoothness that is required, the entire bracket and tube assembly are fitted with a spring loaded counterbalance. The support for the counter-balance is the aluminum permanent mold casting, Figure 1b. This casting is similar in all respects to those described above with the added feature that it must have incorporated in it a locking device to prevent movement of the X-ray tube during exposure. This locking is accomplished by means of a cast-in stainless steel plate against which a thumb screw can be tightened.

The continual tightening and loosening of the thumb screw would tend to break an enameled finish and, since all possible precautions must be taken to have smooth, easily cleaned surfaces on this equipment, the locking insert is made of stainless steel and polished.

Sand core gives long, curved hole in permanent mold casting

In addition to the general room illumination, special oral area lights are normally used. These lights must be movable over a wide range; this requires that the supporting arm linkage have some rather complex shaped parts, one of these is illustrated, Figure 1c.

The particular swivel arm shown is, not only an excellent



3. COMBINATION OF SAND CORES and permanent mold casting gives the designer an unusual amount of flexibility. The thin wall and curved cavity are typical of the advantages of permanent mold catsings.

example of aluminum permanent mold casting, but also illustrates how complex coring can be done rather readily. The part is a single casting and is cored as shown in the sketch. With only ⅛ inch wall thickness over most of the length, it is quite probable that no other method of casting could make this part. Obviously, the curved arm could not be die cast with a core in it and a sand casting would probably have to have a far heavier wall, thus requiring more metal removal in the finishing operation.

Since there is no appreciable movement of the current carrying conductor, the smooth interior surface needed in the case of the X-ray arm brackets is not as essential. All flash and burrs must, of course, be removed to prevent damage to insulation when the wire is run through the hollow arms.

In making this part, a single sand core is used in the mold, the swivel hole is indexed and later drilled as a finishing operation.

All of the equipment made by the Ritter Co., going as it does into dental operating rooms, must present smooth, easily cleaned surfaces. Wherever possible, all sharp corners have been eliminated so as to make thorough cleaning easy. The permanent mold castings described are good examples of this.

Finishing on these castings is:

(1) Rough grind
(2) Fine Grind
(3) Polish, if necessary
(4) Degrease and clean
(5) Apply primer coat
(6) Spot putty and spot sand.
(7) Spray with synthetic enamel
(8) Bake

The procedure outlined above gives a hard, smooth, glossy finish that is remarkably resistant to chipping and wears well.

LEAD DIE CASTING protects X-ray film

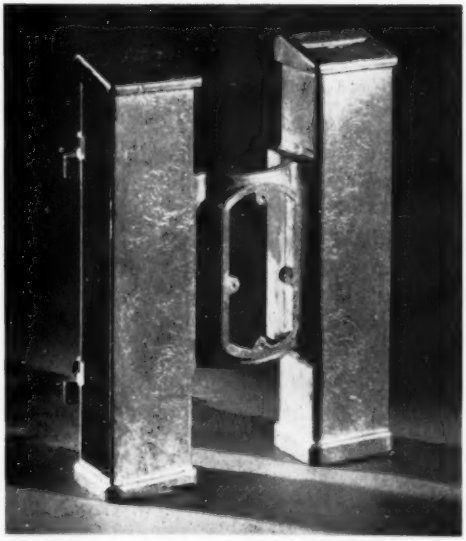
ONE OF the less usual metals in the field of die casting is lead, yet for some purposes, there is no alternate. Such a case is the X-ray film holder used by the Ritter Co.

This die casting made by the National Lead Co. of New York is for the storage of both exposed and unexposed dental X-ray films. Functionally, it must not only hold an adequate supply of film, but must also give ample protection against stray X-rays which would ruin the film.

This particular casting weighs slightly over eight pounds after trimming, thus placing it well within the normal weight limitations for lead die castings. Average wall thickness on this casting is 5/32 inch, about double the accepted minimum wall thickness for castings of this size.

The blind holes to retain the door springs are cored in the casting as is the slot in the top of one leg to allow exposed films to be inserted. All other holes for mounting, name plates, etc., are indexed in the casting and later drilled and, if necessary, tapped.

Finishing is done by applying a coat of wrinkle enamel followed by a coat of air drying lacquer to produce the desired color.



FOR A LEAD DIE CASTING, this X-ray film holder has unusually thin walls and a complex shape. Where lead or a lead alloy is used, die casting is often the most economical method of fabricating.

IT ALL ADDS UP TO THIS...

A quarter of a century's experience gained in making billions of metal powder parts, plus our thorough knowledge of our business, adds up to real and tangible benefits for our customers.

The result of our experience and knowledge is a constantly widening choice of materials and applications. The results of our research are techniques that produce closer tolerances, improved physical properties and more complicated designs.

It all adds up to the fact that metal powder parts made by Moraine do more and better jobs each year . . . that they are produced faster and at lower cost.

Metal Powder Parts by Moraine

MORAINE PRODUCTS

DIVISION OF GENERAL MOTORS
DAYTON, OHIO

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MAXIMUM RIGIDITY AND STRENGTH at the lowest possible weight are secured in the hassock legs and tubular column through the use of die castings. The one piece die cast column has eliminated all joining problems with the attendant high cost and the possibility of working loose in service.

From pressed steel to DIE CASTING . . . Result - increased rigidity and lower costs

THE need of additional rigidity and lower manufacturing costs are the basic reasons why the Berns Mfg. Co., of Chicago, changed many of their fan components from press formed and welded steel units to zinc die castings. This change has resulted in a fan that operates quietly and vibrationless for a longer time and at a lower manufacturing cost.

Two exceptional castings are shown in Figure 1. The cylindrical column used on the low type of pedestal fans was formerly an assembly of a top tilting unit, a tubular column and a flange section. Assembly was by welding and set screws as needed. Now a zinc die casting is used and the entire column made as a single unit. This particular casting is rather exceptional in that a very long draw is required on a side core to form the blind tubular column 11½ inches long.

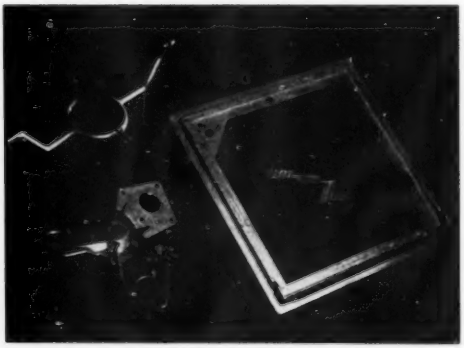
The fan legs for a hassock type fan are also shown in Figure 1. Originally designed as a steel stamping these legs lacked the required rigidity. As a zinc die casting they are adequately strong and are somewhat less expensive to make than the stamped ones.

When a drawn steel housing is used for a motor housing the problem of assembly becomes rather difficult. By using zinc die castings the motor can be assembled in one half of the housing and the other half then bolted on. Properly positioned lugs and bosses in the housing serve to hold all of the motor components in proper alignment. When and if any servicing has to be done on the motor it is easily accessible by removing the upper half motor housing.

continued on page 79

THE CLEAN, SMOOTH LINES of a die casting do much to improve fan appearance. By proper design of the die cast motor housing, assembly costs have been materially reduced, finishing costs are lower and a stronger unit is secured.

REPLACEMENT OF WELDED STEEL assemblies by die castings has reduced repairs on these parts to practically nothing. The one piece motor bracket is simpler and cheaper to make than the assembled steel one it replaces. The fan hub, a die casting, has simplified balancing materially.



PLENTY OF ZINC FOR 1952 — opinion of zinc producer

PREDICTION of a possible surplus of 129,000 tons of slab zinc in 1952, entirely within the higher grades, was the conclusion offered by C. R. Ince, vice president of the St. Joseph Lead Company, speaking before the 34th annual meeting of the American Zinc Institute, Inc., in St. Louis April 21.

Some of the figures upon which Mr. Ince bases his calculations are offered here, along with excerpts from his address, "Slab Zinc Supply and Consumption in 1952."

AVAILABLE SUPPLY — 1,018,000 TONS. Mr. Ince foresees an output of slab zinc of 980,000 tons in 1952 including 55,000 tons of secondary, assuming a sufficient supply of concentrates. In addition, he expects to see a minimum import of 113,000 tons of zinc which is 25,000 tons ahead of 1951. Total slab zinc—1,093,000 tons.

Estimates of exports are 50,000 tons and stockpile shipments of 25,000 tons which "would leave a balance of 1,018,000 for American consumers."

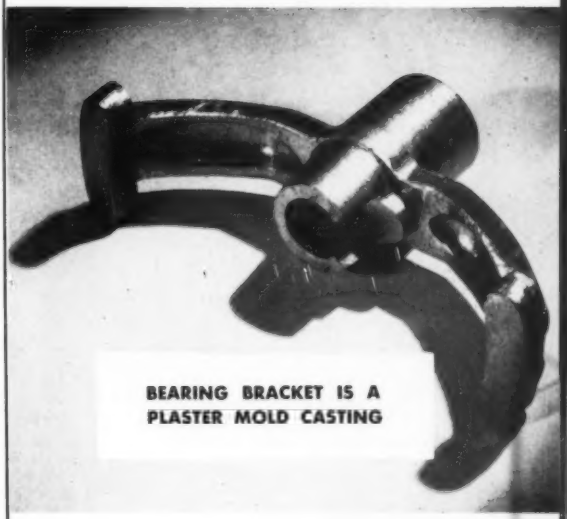
PREDICTED CONSUMPTION — 889,000 TONS. "Over the years, zinc consumption has borne a fairly fixed relationship to such indices of activity as galvanized sheet shipments, brass mill shipments, production of automobiles and major appliances, to name a few major zinc consuming activities . . . " Mr. Ince explained.

Examples cited: one ton of zinc is consumed for 12.8 tons of galvanized sheet shipped; 16 tons of zinc per 100 tons of brass mill products; and for the die casting industry, second largest consumer of zinc, auto production averages 45 pounds of zinc per car. Autos account for 60 percent, appliances 15 percent, of all zinc die castings.

Requirements figures submitted by Mr. Ince for 1952, include: galvanizing — 420,000 tons; zinc base alloys—225,000 tons; brass—150,000 tons; rolled zinc—65,000 tons; French process oxide and other uses—29,000 tons.

The 225,000 tons of zinc base alloys, he said, "would provide enough zinc die castings for the production of 6 million cars and sustain an index of 106 in the major appliances industry, which recently has been running at the rate of 98."

POSSIBLE SURPLUS — 129,000 TONS. Estimated surplus, based on above figures, is 129,000 tons of slab zinc "entirely in the higher grades." As the speaker stated, "This surplus of over 100,000 tons should provide a cushion against any under-estimates on my part, or interruptions in production due to strikes or manpower shortages."



BEARING BRACKET IS A PLASTER MOLD CASTING

Dental engine bearing bracket for the Ritter Company of Rochester, N. Y.; plaster mold casting produced by Atlantic Casting & Engineering Corp., Clifton, N. J.; Alloy — 59-62% copper, 0.75-0.95% lead; balance zinc.

PREVIOUS MANUFACTURING METHODS

1. **Sand casting in alloy — 89% copper, 3% tin, 6.5% zinc, 1.5% lead.**
2. **Forging in same alloy.**

FINISHING OPERATIONS

Mill faces, drill and ream bearing holes, drill and ream set screw holes, polish and plate or paint.

ADVANTAGES OF PLASTER MOLD CASTING

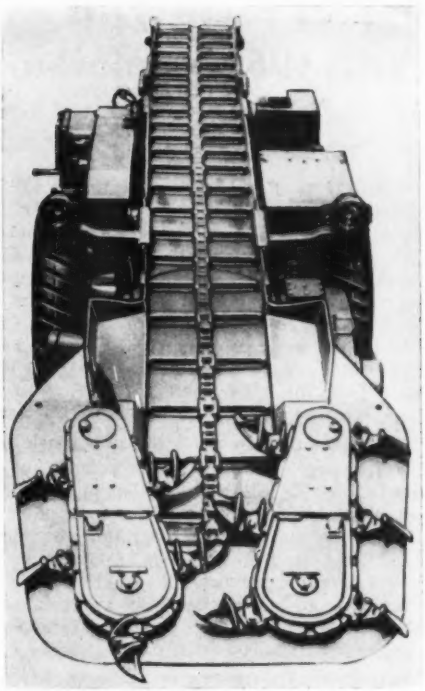
Lower cost due to reduction in machining and simpler finishing sequence.

"VERY MUCH IN FAVOR OF"

MARVEL SYNCLINAL FILTERS

Says: John L. Clarkson, President
The Clarkson Manufacturing Co., Nashville, Illinois

"In coal mining the coal dust settles on and around all parts, connections, and fill plugs. When the plugs for fill pipes are removed, invariably small particles of coal dust drop into the tank. When hose connections are connected in the mine, dust coal particles also get into the line. The filter catches this dust on its first trip around and prevents damage to the pump and cylinders. We are very much in favor of your filters." *John L. Clarkson*



CLARKSON UNDERGROUND LOADING MACHINE

This machine, widely used in the coal mines, has its vital hydraulic power system protected by the Marvel Synclinal filter. Like over 250 other manufacturers, The Clarkson Manufacturing Company installs Marvel Synclinal filters as original equipment.

INCREASE PRODUCTION
REDUCE MAINTENANCE COST

Protect Hydraulic Equipment with Marvel Synclinal Filters

More and more manufacturers and users of hydraulic machines and other equipment with low pressure, non-corrosive liquid systems are depending on Marvel Synclinal Filters to protect their machines' efficiency. Marvel Synclinal Filters are speeding production in a wide range of industries. They offer longer periods of operation between cleanings plus simplicity which enables ordinary workmen to quickly disassemble, clean and reassemble the filter on the spot. Turning a single handnut releases line type for cleaning without disturbing pipe connections.

BOTH SUMP and LINE TYPES are available in individual capacities from 5 to 100 gallons per minute and in mesh sizes from 30 to 200.

★ **WATER FILTERS** In response to the great demand, we have designed both our sump and line types for use in all water filtering applications.

Sump Type (cutaway) Line Type (cutaway)

Write for Complete Engineering Data — Specify Oil or Water

MARVEL ENGINEERING COMPANY
625 W. Jackson Blvd. Chicago 6, Ill.

Meets J.I.C. Standards

INVESTMENT CAST cutters
of stainless steel have cemented carbide tips

THE small cutters which Chicago Pump Company uses on its sewage comminutors are subjected to operating conditions of extreme severity. Large numbers of these cutters, Figure 1, are mounted on a rotating drum submerged in raw sewage.

Purpose of the comminutors is to provide automatic and continuous screening and cutting of coarse sewage matter into small, settleable solids without removal from the sewage channel. Comminuted matter (sheared, small particles passing a maximum drum slot width of 3/8 inch) completely settles out in a primary settling tank, eliminating manually or mechanically raking and processing the sewage.

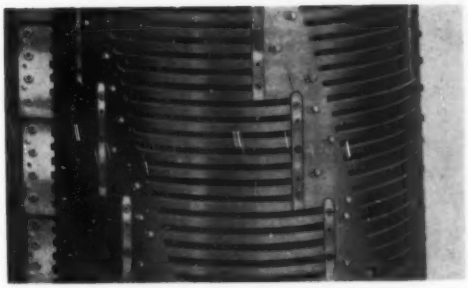
Obviously, several performance characteristics are expected of the cutters used on comminutors. They must:

- Be tough enough to cut a wide variety of materials ranging from bones to rags and from wood to golf balls, that find their way into the sewage stream.
- Be resistant to corrosion so that they maintain their effectiveness despite submersion in sewage;
- Be long-wearing to minimize the job of resharpening or replacement.

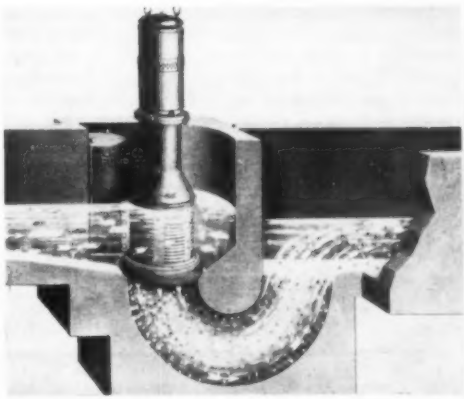
Chicago Pump Company gets these characteristics by the use of teeth such as the one shown at right. This tooth, measuring less than 3/4 inch in its major dimension, is investment cast in stainless steel; the cutting edge is a cemented carbide, mounted into the investment cast body, and ground to proper cutting shape.

The bodies of these cutters produced by Illinois Precise Casting Co. of Chicago. The cutter bodies have a countersunk through hole by which they are mounted onto the comminutor drum. The particular advantage of investment casting for these pieces consists mainly of its ability to produce an irregular shape in a hard alloy at lower cost than cutting it from bar.

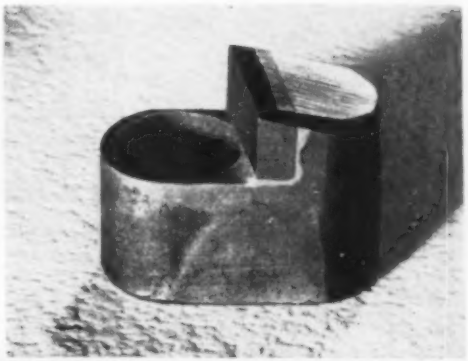
A typical installation may have 75 or more cutters per drum, and since there are thousands of communities which have installations with one to four units of this size, the number of cutting teeth required is considerable. Also, although the cutters may be resharpened several times at the sewage plant, they occasionally need to be replaced. Thus, the volume of pieces needed is enough that tooling costs are a negligible factor. Polystyrene patterns are used.



SEVERE SERVICE CONDITIONS surround the comminutor cutters mounted on a rotating drum, above, and submerged in the stream of raw sewage, below, for constant cutting action.



BY BRAZING A CARBIDE TIP onto an investment cast stainless steel body, a cutter is obtained which resists wear and corrosion and has a long service life.



NATIONAL CASH REGISTER CO.

Pioneers in High Density IRON POWDER PARTS

By PHILIP R. KALISCHER
Associate Editor

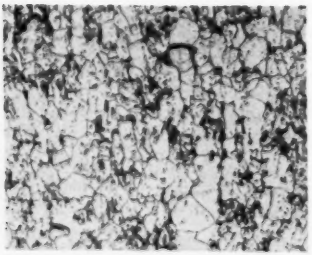
IN previous articles of this series, repeated attention was called to the superior physical properties that can be obtained when iron powder compacts are made with a density that equals or approaches the density of wrought metal. In order to secure this high density, it is necessary to use a high forming pressure to make the green compact and a high sintering temperature. Both of these conditions are considered by many fabricators to be uneconomical because of short die and furnace life and, therefore, the high density parts are not made.

The National Cash Register Co. of Dayton, Ohio, has from the first taken the stand that if *any part is to be made from metal powder, it must have physical properties that are equal to or superior to the physical properties of wrought metal.*

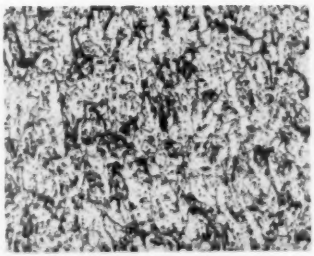
Not only is the strength requirement rigorously set, but the iron powder parts must be made at the same or lower cost to replace machining. *The result of these two requirements has been the development of fabricating methods that have allowed powder metallurgy to compete successfully in many cases with stamping, forming and screw machines.*

There have been two factors in the development of powder metallurgy at National Cash Register Co. that have been largely responsible for their success. The first and most important

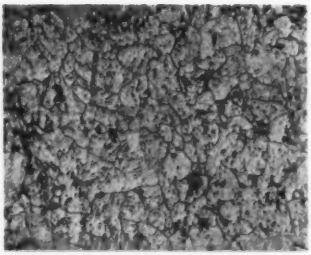
2. EFFECT OF PROCESSING on the structure of high density iron compact is illustrated by the four photomicrographs below. (100 X, Nital etch).



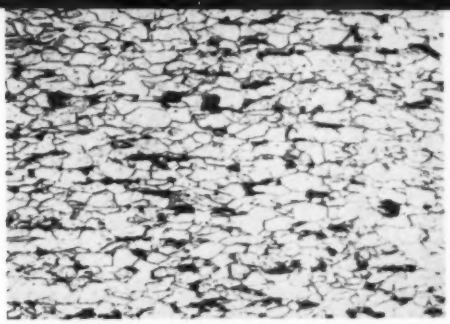
High density iron compact after pressing and first sinter.



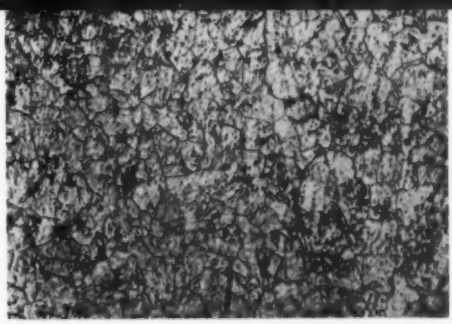
High density iron compact after pressing, first sinter and sizing.



High density compact after second sinter.



SAE 1010 strip stock, blanked & punched (100X 2% Nital etch)



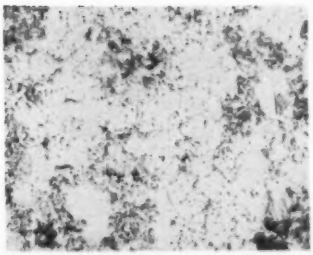
Powdered iron after first sinter (100X 2% Nital etch)

1. STRIKING SIMILARITY in structure between high density iron powder parts and the same part made from strip steel is shown in the photomicrographs above. The absence of original grain boundaries and porosity in the powder part is particularly noteworthy. Density of the powder part is 99 percent that of the strip stock.

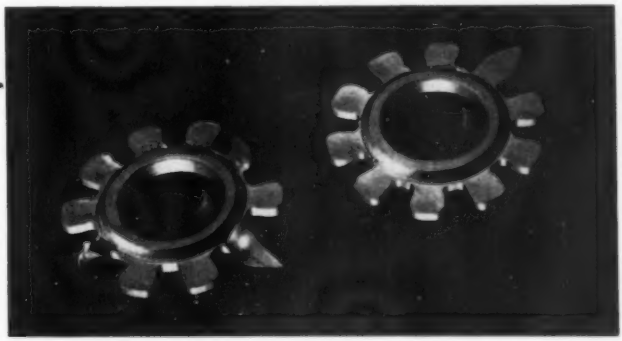
has been the liberal, broad minded point of view taken by management. This has enabled the metallurgist to work for years, if necessary, without too much economic restraint until successful processes were developed. The second is that from the start, the decision was made to operate the powder metallurgy plant as an integral portion of the manufacturing establishment. This latter factor has made available to the men working with iron powder a wealth of technical and manufacturing knowledge such as can best be found in a large and completely integrated operation like this one.

This should not be construed as a blanket endorsement of the so-called captive plant as contrasted with the contract plant. Only a large organization could afford the time and money that the development work required and, having worked out a successful fabricating procedure, their knowledge is now freely made available to the industry.

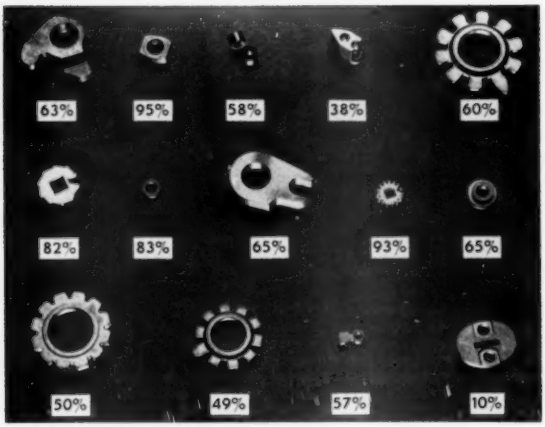
Before discussing some of the actual parts being made from iron powder, it will be best to consider briefly the fabricating procedures used. Thus far, electrolytic iron powder has been found to give the best results with the particular process being used and is used exclusively. The powder is purchased on strict specifications that have been worked out in cooperation with the Plastic Metals Division of The National Radiator Co. of Johnstown, Pa., the producer. As a result the iron powder purchased is uniform from batch to batch so that little or no adjustments of press setup or sintering cycle are required when a new lot of powder is used. These specifications are given in their entirety on page 81.



High density compact after double pressing, double sintering and case hardening.



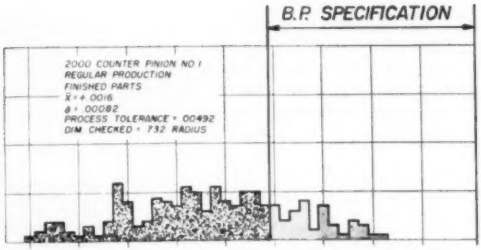
3. COUNTER PINIONS after double pressing and double sintering, but before hardening. Extreme ductility of this material is shown by the ability to withstand severe deformation without fracture. All bends were made cold.



4. DESPITE HIGH DIE COSTS and complex pressing and sintering cycle, important cost reductions are possible in high density iron parts. Percentage given below each part represents the cost reduction resulting from substitution of powder metallurgy for other fabricating methods . . . stamping and screw machine forming.

The dies used are exclusively cemented carbide with high carbon, high chromium punches and carbide tipped core rods. No taper is allowed on core rods and no separate die lubricant is used. Thus far, no die has ever shown any wear and one pair (both forming and coining) has made over three million pieces. While the first cost of these dies is somewhat higher than a tool steel die, their longer life and dimensional stability more than compensate

6. COMPARISON OF DIMENSIONAL ACCURACY of counter pinions made by punch press (a) and powder metallurgy (i). For processing comparison, see Figure 5. Figures b-i below show the dimensional variation during processing by the powder metallurgy technique. Horizontal coordinate in increments of 0.0001; vertical coordinate in increments of 10 pieces per division. B.P. spec ±0.001.



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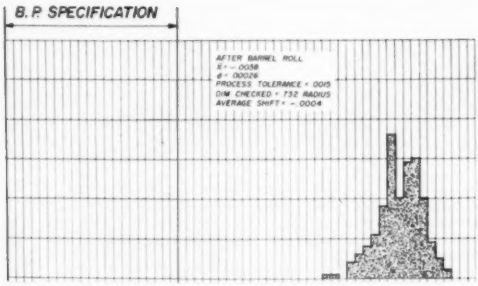

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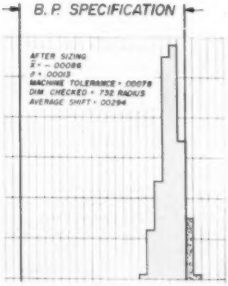

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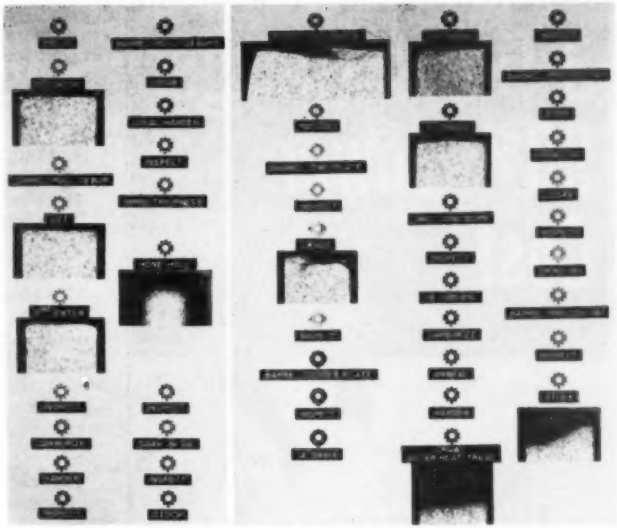
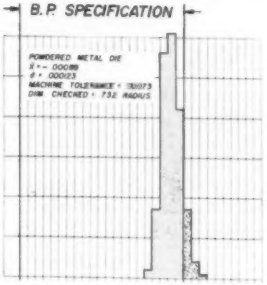
5. SUBSTANTIAL REDUCTION in number of operations and inspections can be obtained by powder metallurgy, as compared with punch press operations required to produce the same part, as illustrated.



for the cost, provided enough pieces are to be made to justify them.

The minimum sized hole that can be cored is not known. Holes as small as 1/16 inch in diameter have been cored, but whether this is a lower limit or not has still to be determined. As would be expected, with decreasing hole size, the difficulties of coring increase and the engineers in charge of this work feel that the minimum sized hole will not be much below 1/16 inch.

Note: Purchasing agent's specifications for electrolytic iron powder are presented on page 81.



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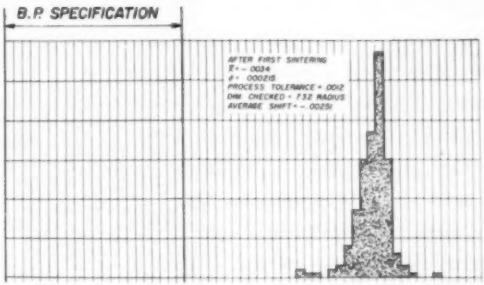

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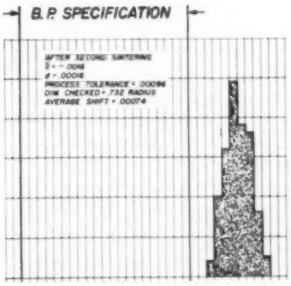

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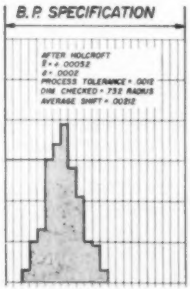

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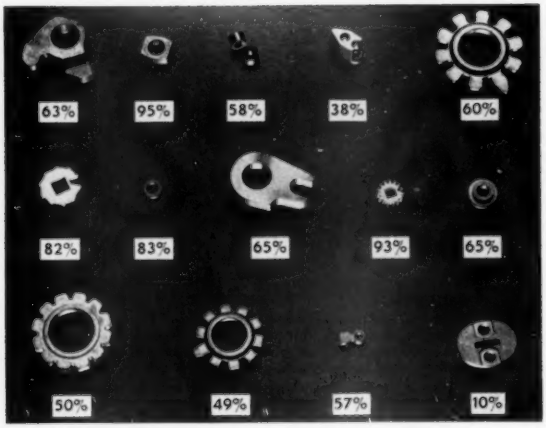

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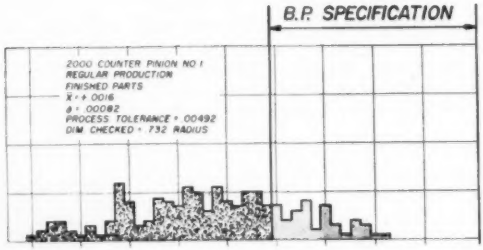

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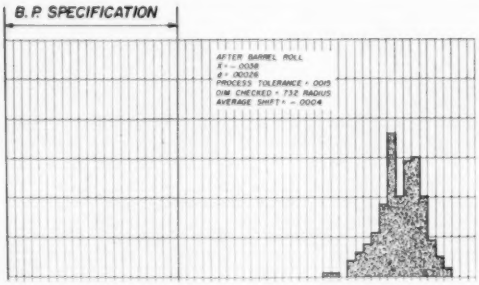

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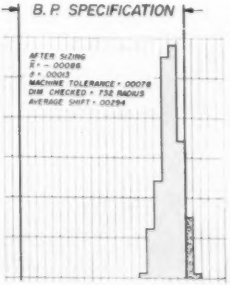

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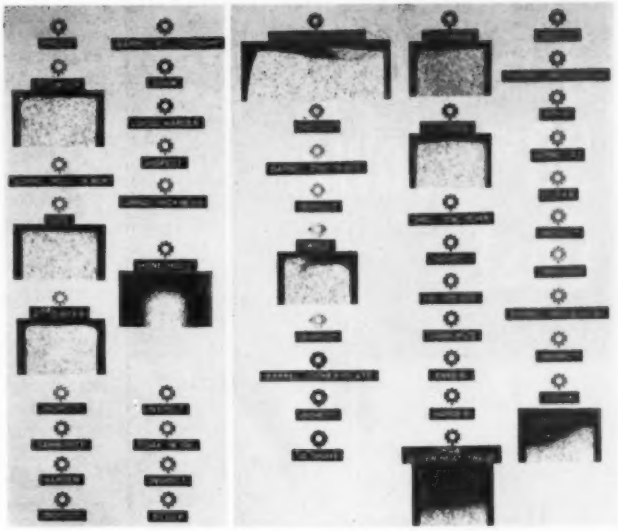

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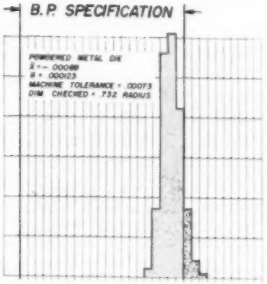

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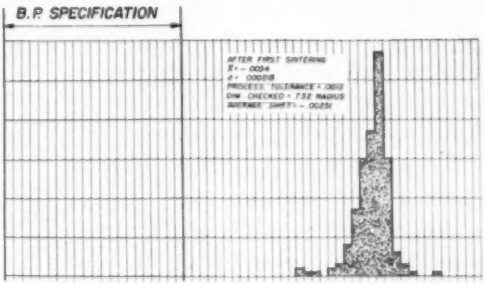

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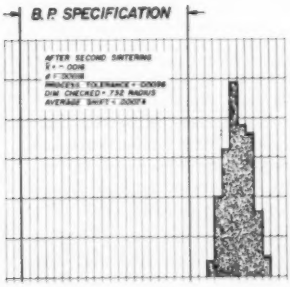

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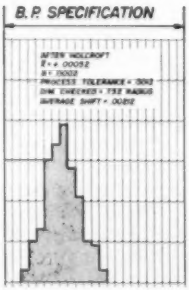

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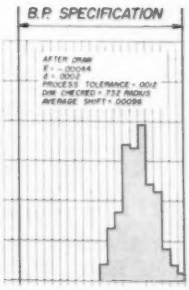


H

I

3 Times Stronger 90% Lower Cost

HERE is an outstanding example of what an Arwood precision investment casting can do.

This is a justifying cam used in a business machine and it was originally designed as a series of 18 stampings to be assembled by pinning and brazing. In its manufacture, Arwood was able to show a savings of 90% and at the same time triple the strength and wear-resistance of the cam. No hand filing or fitting is required in assembling the cast parts and all are completely interchangeable.

Perhaps you have a production problem that Arwood can help you solve. Our engineers, with years of experience in many industries, often are able to make valuable suggestions that result in important savings in manufacturing.

For more complete information about the accuracy, the lower costs and the versatility of precision casting, write for our booklet, "A Critical Survey of Investment Castings."

ARWOOD

PRECISION CASTING CORP.

72 WASHINGTON STREET • BROOKLYN 1, N. Y.

Plants: Brooklyn, N. Y., Groton, Conn., Tilton, N. H.

For additional information circle No. 20 on the Reader Service Card

The pressing and sintering cycle that has been worked out is a double press, double sinter. Except for minor variations, it is:

1. Forming pressure ..... 60 to 65 tsi
2. First sinter, minutes ..... 45 to 60
3. First sinter, temperature ..... 2070 F.
4. Coining pressure ..... 60 to 65 tsi
5. Second sinter, minutes ..... 45 to 60
6. Second sinter, temperature ..... 2070 F.

All sintering is carried out in an endogas atmosphere balanced for approximately an SAE 1010 steel.

Utilizing the fabricating conditions set forth above, the average compacts have a green density of 7.35 g/cc to 7.50 g/cc and a density after the first sinter of 7.40 g/cc to 7.50 g/cc. The final density is over 99 percent of the density of the 1010 strip or sheet stock used for comparison (this material has an average density of 7.7 g/cc).

The excellent structure of the material made by the double pressing, double sintering cycle is shown in Figure 1 where the structure of the sintered powdered iron is compared with the structure of a piece of SAE 1010 steel. The marked similarity is at once apparent. To one familiar with the micro structure of parts made from iron powder, the almost total absence of voids is notable as is the generally "clean" appearance of the metal.

It was pointed out above that the powdered iron parts achieved nearly their final density after a single pressing and sintering operation. Figure 2 compares the powdered iron after a single pressing and sintering, after a double pressing and finally after the second sintering. The coining operation has caused some slight distortion of the grains, particularly near the edges and the final sintering operation has allowed recystallization of the cold worked metal and a general grain refinement throughout the section.

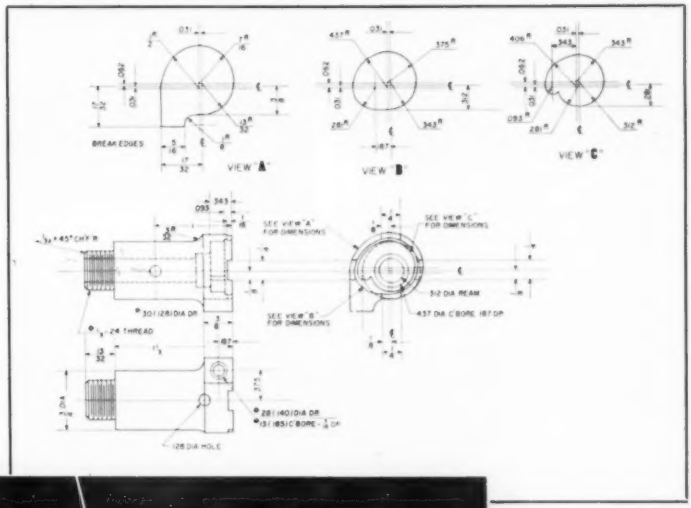
There is no microscopic evidence of the density change caused by the second pressing and sintering.

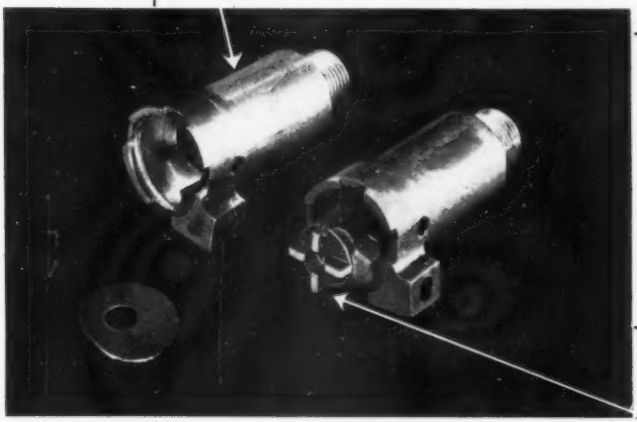
It is interesting to note that nearly the final density of 7.65 g/cc is achieved after the first sinter and before the coining operation. This can best be appreciated by comparing the microstructures at the two stages. Figure 2a is a micrograph of an iron part before coining and Figure 2c is a micrograph of the same piece after coining and sintering for the second time. The absence of voids and the general excellence of the structure shown is remarkable.

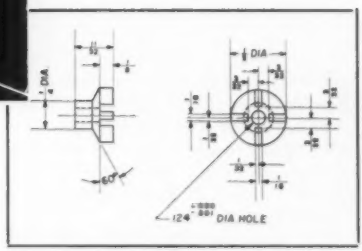
The coining operation and the second sinter have produced a grain refinement that gives added strength and ductility only. According to the metallurgists at National Cash Register Co., it is extremely undesirable to have any voids in the compact that must be closed by the coining

continued on page 70

INVESTMENT CASTINGS in aluminum alloy for midget-size centrifugal pump







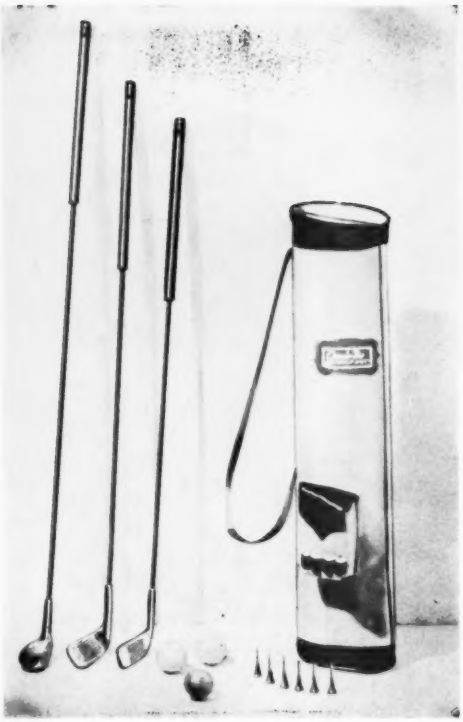
FOR PUMPING SMALL VOLUMES OF LIQUID against a low head, the Telautograph Corp., of New York, has developed a midget centrifugal pump whose housing and impeller are investment castings made by the Z & H Mfg. Co., of Peekskill, N. Y., in 43S aluminum alloy.

The TelAutograph telescriber which transmits written messages over wire and the TelAutograph 'Instan-Form' telescriber which transmits business forms over wire requires an instant supply of ink at the pen feed source. The body and impeller for this centrifugal pump are investment castings, shown in the photograph and drawings.

The simplicity of construction of the pump can be seen from the photo which shows both a complete pump and a pump housing. As can be seen even the threads are investment cast and need only to be cleaned by running a die over them. The impeller has the center hole reamed to size and the drive shaft is pressed in.

Tolerances held by the foundry are, in some cases, quite close. All fractional dimensions are held to $\pm 1/64$ and all decimal dimensions to ± 0.005 except for the reamed hole in the housing and the bore of the impeller.

Other than to machine this pump from either a casting or from bar stock there is, probably, no other economical method of making it in the quantities needed. The original design called for investment casting because it is obviously the most economical method of manufacture that is now available.



CASTINGS THAT DO NOT CRACK when they strike against a steel stake (or a golf ball) are required for these light-weight horseshoes (and junior-sized golf clubs). A special aluminum alloy has been selected for the job.

Sturdy PERMANENT MOLD CASTINGS that resist severe impact

EVEN though toys are made for play and relaxation, they sometimes are subjected to physical abuse and stresses that are comparable with those applied to machines, appliances and similar products. In fact, in the category of sporting goods, high stresses are a fundamental condition of use.

For example, Junior-Pro Products Company of St. Louis manufactures two types of sporting equipment intended for youngsters, where impact resistance of a high order is required. These products are: 1) junior-size golf club sets, and 2) lightweight horseshoe sets for women and children.

Anyone who has seen a horseshoe strike against a steel stake recognizes the sharp impact involved. To obtain lightweight horseshoes which can be tossed by women or children, and yet to retain the needed impact strength, Junior-Pro Products utilizes aluminum permanent mold castings in a special alloy.

The same alloy and manufacturing method are used to make the heads for the diminutive golf clubs, which include drivers, mashies and putters in three sizes each. The alloy is a 4 percent copper—6 percent silicon alloy of aluminum. It casts well, has a smooth surface and adequate strength.

At the present time, restrictions on the use of aluminum have curtailed production of these units, but when normal supply situations prevail, Junior-Pro will resume full scale production of these horseshoes and golf clubs with aluminum permanent mold castings.

Very little work has to be done on the castings after they come from the mold. Trimming of the sprue, gate and overflow vents, plus a polishing operation, complete the processing.

PMM

Finishing Section

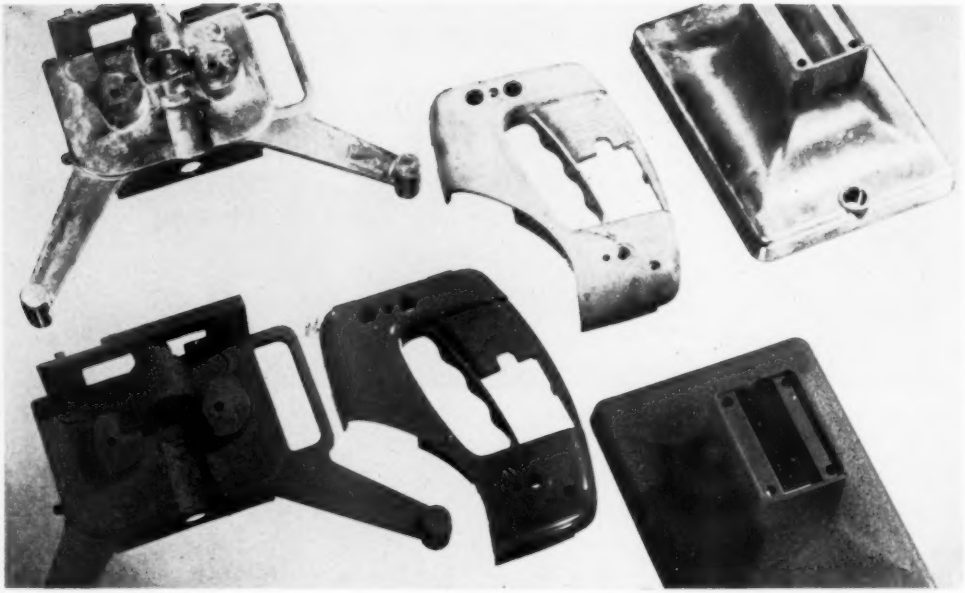
SURFACE FINISHING

Most precision metal molded parts receive some type of surface finish such as plating, organic coating, anodic coating or chemical coating. This section includes information on the methods, processes and equipment used in these surface treatments.

A Section Devoted to Specialized Finishing of

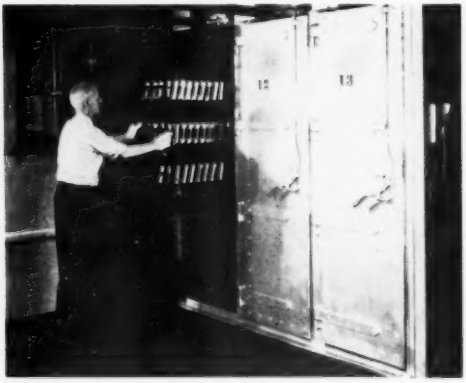
Die Castings • Investment Castings • Powder Metal Parts
Permanent Mold Castings • Plaster Mold Castings

ORGANIC FINISHING



HERE'S A "BEFORE-AND-AFTER" SHOT which shows what Kodak does when it finishes its castings. Shown from right to left are aluminum, magnesium, and zinc castings.

SPRAYING THE PRIMER on a zinc casting. All castings get the same type of treatment at this step except for the fact that magnesium castings receive a preliminary sprayed and baked-on coat of special magnesium primer.



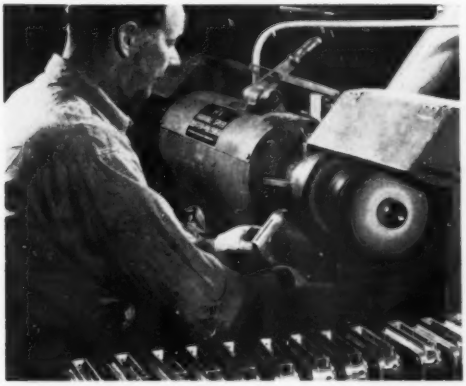
THE PRIMER COAT IS BAKED on all castings in these ovens. Temperatures range from 300-375 F depending on type and length of time in oven.

# of Die Castings at Eastman Kodak

THE wide use of organic finishes by the Eastman Kodak Co., of Rochester, N. Y. has evolved a system of handling that provides the utmost in economy of operation, safety for the workmen, and safety for the plant. Characteristic of the care exercised is the cleanliness of the grinding, buffing and polishing departments where "white glove" inspection is the rule rather than the exception.

For most applications a non-reflecting glare proof finish is most desirable. Above all, the finish must be tough to resist the relatively rough handling that cameras get. Many of the items are given a crackle finish, others a smooth lacquer. All types of finish applied are baked enamel or lacquer.

Here are pictures of a few of the finishing operations as practiced at Eastman Kodak.



ON MOST ALUMINUM WORK, such as this case for a Cine Kodak Eight Camera, the buffing and polishing of desired sections is done before spraying to simplify procedure and produce the best results.

ON MAGNESIUM CASTINGS the castings are given a Dow No. 7 treatment before spraying. This makes paint adhere better and reduces the possibility of corrosion. Aluminum castings are cleaned in a mild alkaline solution before finishing. Zinc castings are phosphate coated.

WRINKLE FINISH IS SPRAYED on any castings if desired. This is an aluminum projector casting. This wrinkle finish is developed in a steam oven prior to regular bake but not all wrinkle finishes are developed by steam.

PARTS COMING OUT of one of the ovens and going directly to inspection are shown here. This is the procedure followed with most finishes.

SPECIAL REPORT ON FINISHING OF PRECISION METAL MOLDINGS IN PMM FINISHING SHOW ISSUE

IN RECOGNITION of the importance of finish-engineering of metal parts within the "precision" category, and timed to coincide with the Industrial Finishing Exposition of 1952, the editors of PRECISION METAL MOLDING magazine will present a report of materials, methods and equipment especially suited for the finishing of precision metal parts.

The June issue of PMM, which will be distributed from the magazine's booth at the Finishing Exposition, will include:

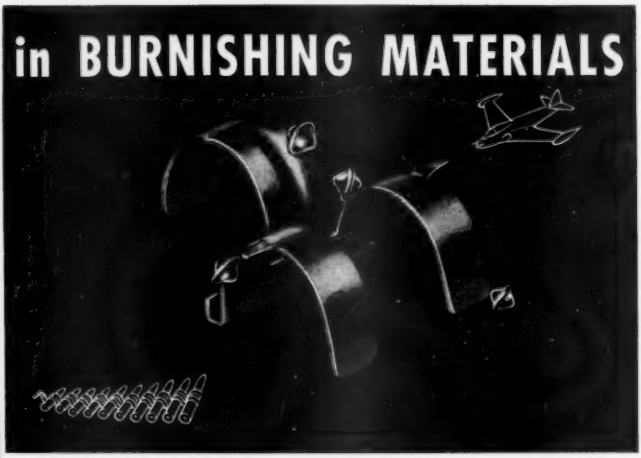
- A report on finishing materials, methods and equipment for precision metal moldings;
- A reference library of literature available from manufacturers of all types of finishing products;
- A review of the place of the design engineer in specifying and understanding the importance of finishes.

The Industrial Finishing Exposition offers an outstanding place for the presentation of this subject, since it is the focal point of the year on the subject of industrial finishing techniques. It will be held June 16 to June 20, 1952 at International Amphitheater in Chicago under the sponsorship of the American Electroplaters' Society. It is held in conjunction with the annual AES convention at the Conrad Hilton Hotel.

Attendance at the show is estimated at 20,000 visitors to see the wide range of displays. Among the types of products to be exhibited are: abrasive belts, adhesives, air compressors, air heaters, anodes, booth coatings, buffing compounds, buffs.

Also, centrifugal dryers, burnishing barrels, cleaning compounds, conveyors, degreasers, dipping machines, electrical controls, enamels, exhaust equipment, filters, generators, grinding wheels, japans, lab equipment.

Also lacquers, masking devices, ovens, paint, plating equipment and supplies, polishing equipment and supplies, rectifiers, surface conditioners, abrasive blasting equipment, temperature controls and indicators, washing equipment, wire brushes, and many other classes of equipment.



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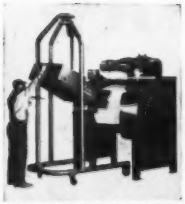

SUPERSHEEN MODEL DB-200

An example of Supersheen superiority. This advanced design barrel handles micro-finishing of small precision parts with same ease of fast cutting down of larger castings, forgings, etc.

Why worry about man power shortages and high-cost labor? These two BIG PROBLEMS are now being solved by large and small manufacturers with Supersheen Advanced Barrel Finishing Equipment. *A SINGLE UNIT INSTALLATION REPLACES FROM 2 TO 12 MEN;* savings run as much as 95% under former finishing methods. Mail coupon at right for complete information.

FREE SAMPLE PROCESSING

ALMCO Supersheen

AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT—MATERIALS AND COMPOUNDS
ALBERT LEA, MINNESOTA

1. IF YOU PRODUCE PARTS THAT REQUIRE FINISHING OF ANY KIND . . .
this 22 page booklet is *guaranteed* to open your eyes! It gives you the inside story of advanced barrel finishing *as never told before!*

2. COMPLETE CATALOG . . .
of America's most complete line of advanced barrel finishing equipment. *All types!* Barrel sizes range from 8"x16" to 30"x60". *All-Mechanical* loading and unloading equipment, separating and storage equipment, etc. *For large and small plants.*

3. FOR THE FINEST FINISH EVER . . .
Almco Supersheen Abrasive Chips and "Concentrated" Compounds. For *any and all* types of barrel finishing! Catalog gives specific data on the industry's *most complete line* of barrel finishing materials.

ALMCO SUPERSHEEN Dept. D-5 Albert Lea, Minnesota

Send me the above 3 catalogs at once.

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It Will Mean
Money In
YOUR Wallet...

INDUSTRIAL FINISHING
Exposition of 1952

You can't afford to miss this presentation of the latest advances in the metal finishing field . . . Make Leap Year a Reap Year! Stay a jump ahead of your competition—board the metal finishing band wagon—It's Chicago for you in '52.

SEE EXHIBITS IN THESE FIELDS—Electroplating equipment and supplies, abrasives, organic finishes, materials handling apparatus, industrial coatings, chemical processes, adhesives, etc.

JUNE 16-19, 1952

INTERNATIONAL AMPHITHEATRE, CHICAGO

SPONSORED BY AMERICAN ELECTROPLATERS' SOCIETY

J. H. CRISTIL CO. SET UP DEPARTMENT TO IMPREGNATE DIE CASTINGS

A large impregnating department recently installed in its factory has created a volume of work on die castings for the J. H. Cristil Company, in Edgerton, Ohio. The Cristil Company besides impregnating also performs machining operations and has a large anodizing section under a chemical engineer.

The impregnating equipment and installation represents a $10,000 project, Hugo V. Meisner, general manager and vice-president, has announced. Meisner was connected with a St. Louis die casting plant until he joined the Ohio company three years ago.

While the Cristil factory is 100 percent engaged in defense contract work at the present time, Meisner foresees many peacetime applications for impregnating die castings as well as other castings.

The system treats "leaker" castings by alternating vacuum and high pressures to close porous conditions with the use of plastic compounds; after baking the plastic is porous tight against moisture leakage.

A FAMILIAR LOOK

The worker looking at the 1952 Plymouth doorhandle recognized something made in his own shop when the Auto-Lite Salute program brought the car to Auto-Lite's Woodstock, Ill., die casting plant where he works. Forward, the Plymouth hood ornament (the ship) was also something "home brewed." Workers at this die casting plant have had a look at nearly 15 brands of cars on which Auto-Lite products are used. On this car they recognized some 19 items.

CHEMICAL ADDITIVES IMPROVE LUBRICANTS

Presentation of the paper, "Chemical Addition Agents for Lubricants", was made before the Baltimore Section of the American Society of Lubrication Engineers on March 27 by W. D. Thomas, of American Cyanamid Company.

Mr. Thomas traced the historical development of lubricants over the past 25 years, and showed how the use of chemical additives has solved many of the problems imposed by engine design, fuels and operating conditions. "In the development of the new high output engines, many problems were encountered which required in stepwise fashion the development of superior type lubricants to overcome them," he explained. "The petroleum industry, working in cooperation with the equipment manufacturers has been able to develop lubricants to meet the higher demands and has accomplished this end chiefly by chemical additives."

ACROMARK
MEANS "ACCURATE MARKING"

ENAMEL FILL YOUR DIE-CAST PARTS with THE ACROPRINTER
Reg. U. S. Pat. Off.

Write for Latest Literature

Hand and Motor Driven Models

The ACROMARK Company
426 Morrell St., Elizabeth 4, N. J.
"The Original Marking Specialists"

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BECAUSE Hydro-Finish employs fine mesh abrasives suspended in water, it does a precision cleaning job without danger of excessive metal removal. Tolerances are held to .0001"! Result: more years of service from your dies!

What's more, Hydro-Finish saves you time and labor. Operated by one man, it removes scale and discoloration in *minutes* instead of hours! Cleaned surfaces are virtually free of directional grinding lines, eliminating or reducing further finishing operations.

Get the facts on how Hydro-Finish can save you money! Write today for Bulletin 1400A. Address: PANGBORN CORPORATION, 3500 Pangborn Blvd., Hagerstown, Md.

Get ***PANGBORNITE.*** Best abrasive for all liquid blasting needs. Available in many mesh sizes.

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment.

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BLAST CLEANS CHEAPER
with the right equipment for every job

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LOW COST
IRIDITE
FINISHES
for zinc, cadmium, aluminum and cuprous metals
provide
corrosion resistance
paint base
choice of appearance
And they are easy to apply! Just a simple chemical dip for only a few seconds produces the coating.
LOW MATERIAL AND SHIPPING COSTS
combine to make Iridite the most economical chromate finish you can buy. Many Iridite chemicals are packed in powder form, thus can be shipped to you in steel pails at freight savings of up to 75%! Pails take less storage space, are easier to handle, eliminate carboys, need not be returned.
WHY NOT TEST IRIDITE ON YOUR PRODUCTS? Write for literature and send samples for free test processing. See "Plating Supplies" in your classified telephone directory or write direct.
Iridite is approved under government specifications.
ALLIED RESEARCH PRODUCTS
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4004-06 E. MONUMENT STREET • BALTIMORE 5, MD
Manufacturers of Iridite Finishes
for Corrosion Protection and Paint Systems on Non-Ferrous Metals; ASP Plating Brighteners.
West Coast Licensee: L. H. HUTCHIE COMPANY
For additional information Circle No. 83 on the Reader Sevice Card

ASTE ELECTS NEW OFFICERS

Leslie B. Bellamy, Detroit manager, Sterling Grinding Wheel Division, Cleveland Quarries Company, was elected president of the American Society of Tool Engineers for 1952-1953, at the Society's 20th annual meeting. He succeeds J. J. Demuth of the National Production Authority in Washington, D. C.

Elected first vice-president of the society was Roger F. Waindle, director of research, The Nugent-Sand Company, Inc., Muskegon, Mich. Joseph P. Crosby, vice-president, The LaPointe Machine Tool Company, Hudson, Mass., was named 2nd vice-president and Dr. Harry B. Osborn, Jr., technical director, TOCCO Division, The Ohio Crankshaft Company, Cleveland, was named 3rd vice-president.

Howard C. McMillen, plant manager, Philco Corporation, Bedford, Ind., was re-elected treasurer of the A.S.T.E.; H. E. Collins, chief production engineer, Hughes Tool Company, Houston, Texas, was elected secretary; and Gerald A. Rogers of the Rudel Machinery Company, Ltd., Montreal, Canada, was elected assistant secretary-treasurer. Harry E. Conrad of Detroit is executive secretary of the Society.

Elected as new directors are: Willis G. Ehrhardt, managing partner, Ehrhardt Tool & Machine Company, St. Louis, Mo.; Gerald A. Rogers; Fred J. Schmitt, director of sales, D. A. Stuart Oil Company, Ltd., Chicago; and Roger F. Waindle.

Directors re-elected are: L. B. Bellamy; T. J. Donovan, Jr., owner, Donovan Company, Philadelphia; H. B. Osborn; George A. Goodwin, chief process engineer, The Master Electric Company, Dayton; B. J. Hazewinkel, president, Daily Grinding, Inc., South Gate, Calif.; and W. B. McClellan, engineer, Gairing Tool Company, Detroit; and J. J. Demuth, past-president, also serves as a director.

PARKER-KALON PRESIDENT, SELF-TAPPING SCREW INVENTOR DIES

Heyman Rosenberg, founder, officer and director of the Parker-Kalon Corporation, 200 Varick St., New York, N. Y., died February 29, 1952 at the age of 78 years.

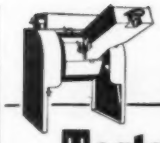
Mr. Rosenberg came to the United States in his early youth and entered the business of sheet metal fabrication, which led to his interest in fasteners for that field. With Louis Goldburg, he established the Parker-Kalon Corporation in 1914.

He was the originator and patentee of self-tapping screws, which are today universally

Heyman Rosenberg

used in the assembly of automobiles, aircraft, ships, electrical appliances, and other metal and plastic products of every description. More than one-third of all screws manufactured in the U. S. today are reported to be self-tapping screws.

A prolific inventor, Mr. Rosenberg had been granted over 200 United States and foreign patents, most of which covered screws of various types and machinery for their production. His mechanical genius was internationally recognized. He was the recipient of many engineering honors, including an award by the Franklin Institute of Philadelphia, and a pioneer inventor's award by the National Association of Manufacturers.



BARREL FINISHING NEWS

Tests prove Super Honite gives top cutting speed!

ST. PAUL, MINN.—Industrial research groups across the country recently completed a series of comparative tests on the cutting speeds and lasting qualities of all barrel finishing chips now on the market.

Results of these tests have just been announced by Minnesota Mining & Manufacturing Company—a leading abrasives manufacturer.

Punishing tests proved no other chip on the market cuts faster than "Super Honite."

This improved stone is formed by fusing grains of the world's toughest abrasive mineral—aluminum-oxide—with a ceramic, non-crystalline bonding agent that will not fracture or crumble.

LASTS TWICE AS LONG

The combination of a super-tough abrasive and a super-tough bonding agent gives "Super Honite" a 100% longer cutting life than other stones. In fact, *no other barrel finishing abrasive* lasts as long.

NEVER STOPS CUTTING

"Super Honite" never wears smooth. New cutting edges are constantly exposed as the surface area is slowly reduced.

Since the composition of each chip is the same throughout, used stones can be re-graded and used again on different operations, too.

IMPROVED CHIP CUTS FINISHING COSTS!

ST. PAUL, MINN.—Barrel finishers all over the country report lower costs per finished unit with "Super Honite"—an improved abrasive chip that outcuts and outlasts all others.

Many users discover a reduction of "lodging" due to chip breakdown, too. Sludge formation is held to a minimum.

And "Super Honite" saves polishing operations on zinc die-castings, brass and aluminum parts. There's none of the usual darkening.

See for yourself! Order a trial supply today. Write 3M, Dept. PMM, St. Paul 6, Minn., for information and prices.

Barrel Finishing Experts offer you FREE services!

ST. PAUL, MINN.—Experienced 3M Engineers are now ready to work with you for increased barrel finishing efficiency, and a system that's tailored to your *particular* job.

They'll show you how "Super Honite" works best in combination with "Honite" Compounds . . . how The 3M Method can finish to micro-inch surface tolerances . . . how to choose the correct chip size and barrel rotating-speed.

Use the coupon at right for immediate attention, and a copy of "3M Barrel Finishing." There's no charge or obligation.

Honite® BRAND

Made in U.S.A. by Minnesota Mining & Mfg. Co., St. Paul 6, Minn.—also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing, "3M" Abrasives, "3M" Adhesives. General Export: 270 Park Avenue, New York 17, N. Y. In Canada: London, Ont., Can.

Minnesota Mining & Mfg. Co.
Dept. PMM, Saint Paul 6, Minnesota

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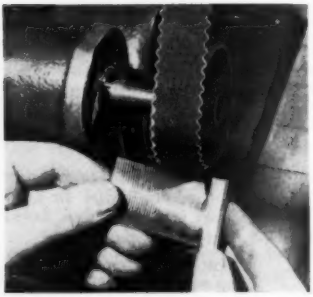
For additional information Circle No. 92 on the Reader Service Card

PMM NEW PRODUCTS

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail —no postage is required.

BELT FOR GRINDING, FINISHING JET BLADES IN SINGLE OPERATION

3M Scallop-Edge abrasive belt
Minnesota Mining and Mfg. Co.



SPECIAL FEATURES: Designed for automatic precision grinding and finishing of jet turbine and compressor blades in a single operation; described as "an immediate solution to a bottleneck in jet aircraft production." Also reported useful for small-radius grinding and filleting previously done by hand.

SPECIFICATIONS: Abrasive belt has serrated edges. In use, the scallops along the edge curve around the edges of the contact wheel, allowing fillets to be polished on the edge contour of the wheel.

Belt is said to combine foil grinding and root grinding operations previously required as separate steps in finishing jet blades. Finishing costs reported to be 20 to 50 percent less.

For additional information Circle No. 105 on the Reader Sevice Card

CLOSER CONTROL OF PATTERNS FOR INVESTMENT CASTING

3-C Plastics
Centrifugal Casting Supply Co.

SPECIAL FEATURES: Accurate control of shrinkage, freedom from seasonal and temperature variations which affect wax pattern materials, are reported for a new plastic pattern composition intended for centrifugal investment castings, Requires no die lubricant because the plastic is non-adhesive and leaves the mold without distortion or streaking. High gloss and lustre on surface ensure pattern detail.

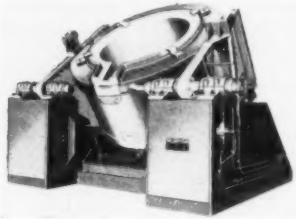
SPECIFICATIONS: New plastic is a stable compound with low melting point, approximately 150 F. Material is highly resilient and can be handled in any manner without injury or distortion. Can be cast in metallic or rubber molds.

Homogeneous mass said to cast smoothly without pinholes or porosity. No modification of casting equipment is required. Said to eliminate high rate of rejects and "touch-up".

For additional information Circle No. 106 on the Reader Sevice Card

12½-TON HYDRAULICALLY OPERATED TILTING MELTING FURNACE

Bellevue Industrial Furnace Co.



SPECIAL FEATURES: Furnace and pot are tilted by means of hydraulic cylinders which are completely piped with flow control valves installed in oil lines, allowing adjustment of flow control to give desired tilting speed. Return stroke is double control: 1) a cam flow adjustment to allow limited rapid return to stop pouring of the metal, and 2) a flow control to permit remainder of the return stroke to cushion furnace into return position. Lever handle control valve is mounted on side of furnace structure convenient for operator to observe the pouring of metal while operating the furnace.

SPECIFICATIONS: Metal heated by means of burners mounted below pot firing tangentially to the internal lining for uniform heat distribution. Unit may be built for gas, oil or gas-oil combination firing. Venting out the hot gases takes place between pot and refractory ring at top of furnace. Pot size 76" diameter, 37" depth.

For additional information Circle No. 107 on the Reader Sevice Card

ELECTROCLEANER FOR BRASS

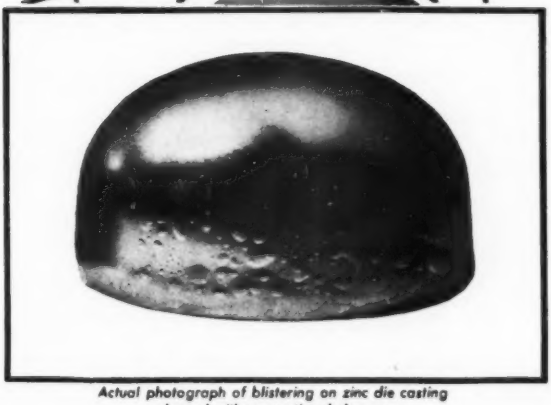
Diversey #101
The Diversey Corp.

SPECIAL FEATURES: New alkaline material developed for electrocleaning brass prior to plating. Has detergent and emulsifying properties, will not stain or darken brass. Said to have superior water softening action that eliminates film in solution and rinse tanks.

For additional information Circle No. 108 on the Reader Sevice Card

BLISTERING, STREAKING

ON ZINC BASE DIE CASTINGS!



Actual photograph of blistering on zinc die casting cleaned with conventional cleaner.

Designed especially for reverse current electro-cleaning of zinc base die castings prior to electroplating, new Diversey No. 505 completely, safely removes all unwanted deposits! In addition, Diversey No. 505 conditions the surface of the zinc, providing better adhesion between the electro plate and the base metal!

This unique, double-action of Diversey No. 505 helps provide a uniformly clear, brilliantly lustrous finished surface . . . one free from blistering, peeling and streaking! Diversey No. 505 is economical, easy to use and available now! Investigate Diversey No. 505 today! *Mail the coupon for FREE copy of New Bulletin.*

DIVERSEY No. 505

NEW electro-cleaner and surface conditioner!

THE DIVERSEY CORPORATION
Metal Industry Department
1820 Roscoe Street • Chicago 13, Illinois
In Canada: The Diversey Corporation (Canada) Ltd.
Lakeshore Road, Port Credit, Ontario

THE DIVERSEY CORPORATION
Metal Industry Department
1820 Roscoe Street, Chicago 13, Illinois

Gentlemen:
Please send me complete information, including New Bulletin on Diversey No. 505.

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*Company*_____

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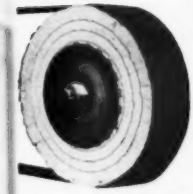
Your best bet's FORMAX

for

ZIPPO BUFFS

These famous long-wearing buffs run cool under all buffing conditions. Constructed of high count bias-cut cloth mounted on safe steel centers. Available in a wide range of densities and center diameters.



for

STYLE C-20 CONTACT WHEELS and F-26 Belt Lubricant

A C-20 flexible Contact Wheel will form itself to the shape of the work and permit the abrasive belt to polish contoured surfaces and F-26 Abrasive Belt Lubricant will increase belt life by preventing loading and glazing. Produces finer, smoother and brighter surfaces through lubrication.

for

BUFFING COMPOUNDS

A complete line of production buffing compounds. Produced in bar and tube form. Formax is the originator of the "Spraymax" Liquid Compounds for brush or spray application.

for

FLEX-A-GLU POLISHING WHEEL CEMENT

—A flexible synthetic adhesive in a ready-to-use form. Dries quickly. Increases polishing wheel life and produces uniform finishes regardless of grit size used.

Send for Descriptive Literature

FORMAX
THE FOUR-IN-A-LEAGUE

FORMAX MANUFACTURING CORP
3171 Bellevue Ave. DETROIT 7, MICH.

MANUFACTURED IN CANADA BY JOHN GALLOWAY LTD., KITCHENER, ONT.

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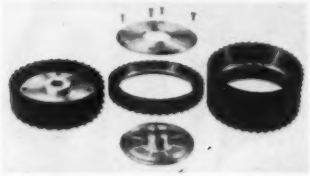
UNIVERSAL HUB CONTACT WHEEL CUTS COST OF REPLACEMENTS

Universal Hub
The Carborundum Co.



SPECIAL FEATURES: New type Universal Hub for contact wheels takes up to 144 different fires of varying width and/or durometer, thus permitting everything from rough belt grinding down to the finest finishes on flat surfaces and contoured parts, employing the same basic Universal Hub, without removing the hub from the spindle.

Rubber contact tire, when worn out, is discarded and replaced by a new tire at half the cost of a standard new contact wheel replacement.

SPECIFICATIONS: The Universal Hub contact wheel consists of a 3-part bolted metal assembly which includes a flanged hub, a T-61 serrated rubber tire and a side plate. Each part of the assembly is separately balanced so that they are not only interchangeable, but are in balance in any combination of assembled contact wheel units.

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GET DUMORE

the drill head with automatic built-in controls

- **New Resistance Drilling**—Workpiece material governs feed and speed rate.
- **Self-Contained Air** — Simply plug into electric outlet. Built-in air compressor feeds drill at proper rate.
- **Air Pressure Regulator** — (0 to 15 psi.) Operator sets to compensate for drill size and workpiece material.
- **Adjustable Stroke Control**—Stop nuts control drilling depth from 1/32" to 1-1/8" (.004" accuracy).
- **Automatic Chip Clearance** — Depth staging eliminates chip clogging.

Get the information on this revolutionary tool. See how it stops operator guesswork, provides flexible setup. Combines big cost reductions with low price tag. Write for bulletin.

THE DUMORE COMPANY
1317 17th ST. • RACINE, WIS.

and get all these cost reducing benefits

Motor manufacturer doubled output, decreased drill breakage.

Labor costs on bronze nozzle holders slashed $75 on first run.

Sound equipment manufacturer cashed in on big savings.

For additional information Circle No. 88 on the Reader Service Card

TOP-FIRED CRUCIBLE FURNACES SAVE FUEL IN METAL MELTING

Markley Top-Fired Crucible Furnaces
Morrison Industries

SPECIAL FEATURES: Reported fuel savings of 25 to 30% on aluminum and up to 50% on brass and copper; longer burner life and 50% longer pot life.

SPECIFICATIONS: Oil or gas fired furnaces in single or twin units; combined radiant and convection heating for faster heating; manufactured in standard sizes (Nos. 50 to 400) in both stationary and tilting types.

No slag buildup is possible; lining easy to replace because there are no burner ports; burners are readily inspected because the holes are in the cover; burners cannot become plugged with metal or slag.

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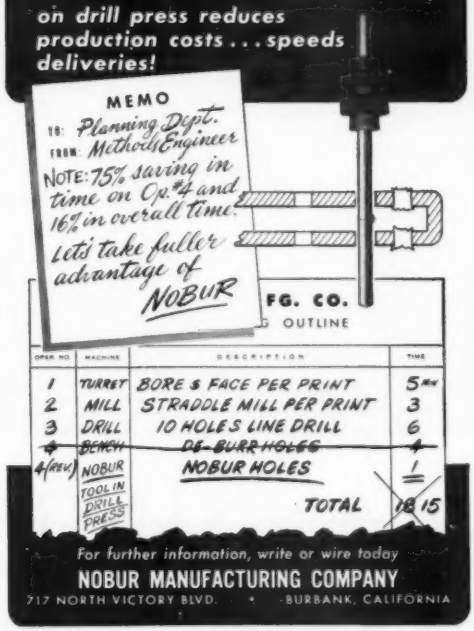
Deburring with NOBUR tool
on drill press reduces production costs . . . speeds deliveries!


MEMO
TO: Planning Dept.
FROM: Methods Engineer
NOTE: 75% saving in time on Op. #4 and 16% in overall time.
Lets take fuller advantage of NOBUR
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OPER NO | MACHINE | DESCRIPTION | TIME
1 | TURRET | BORE & FACE PER PRINT | 5
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4 | BENCH | DE-BURR HOLES | 4
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TOTAL 18 15

For further information, write or wire today
NOBUR MANUFACTURING COMPANY
717 NORTH VICTORY BLVD. • BURBANK, CALIFORNIA

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Cut SPRAY PAINTING COSTS

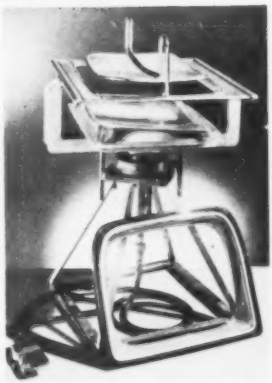
by rapidly wet painting three-dimensional parts, one color after another, through the use of

ELECTRO-FORMED METAL MASKS
(MADE BY PATENTED PROCESS)
AND FOOT TREADLE AIR-OPERATED CLAMPS, FIXTURES AND TOOLS

which position and hold the piece snugly in the mask; maintain the desired pressure, and permit the operator to use both hands.

Plug-type masks for keeping depressed areas clear, while spraying background; lip-type masks for protecting the background while painting depressed areas; and block cut-out plane surface type masks.

Clean, sharply defined letters and decorative effects are obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas with no fogged edges. After-wiping or buffing off of overspray is unnecessary. The "loose" inside of letters and numerals, such as "O" and "9", is held in position by arched bridging to eliminate objectionable "ties."



We design, engineer and build automatic, entirely air-operated machines for spray decorating a variety of small parts at speeds of up to 3600 per hour. Eliminates the hazards of electric motors, mercury or solenoid switches and the cost of explosion-proof electrical equipment.
Masks are inserted so as to be flush with top of the working table. Spraying is from below. Frequency of mask cleaning greatly reduced. Dial regulates the cycling speed. Using a conveyor belt, operator can use both hands to load. Another dial regulates the amount of paint sprayed. At any given setting, the same amount of paint is sprayed on every part, regardless of the speed of the loading cycle. Effects paint savings of up to 50 percent over hand spraying.
Employs 8 latest automatic guns and two 2-gallon air-agitated paint pressure tanks with four insert containers.
We also build mask washing equipment.

SEND COUPON NOW!

CONFORMING MATRIX CORPORATION
346 Toledo Factories Bldg. Toledo 2, Ohio

Please send without obligation, details on ( ) Hand masks; ( ) Mechanical masking fixtures; ( ) Air operated masking fixtures; ( ) Stationary automatic spray painting masking machines; ( ) Rotary table automatic spray painting masking machines; ( ) Quotation on masks for parts (or prints) which I am forwarding.

Name .....
Firm .....
Street .....
City ..... State .....

For additional information circle No. 66 on the Reader Service Card

THIS BELT ALWAYS TRACKS . . .

which definitely prevents weaving of the belt when heavy grinding pressure is applied. Proper operating tension may be maintained through a handy manual control, thus avoiding build-up of loose belt that may appear at the point of grinding contact. The 180-degree "wrap-around" facilitates proper tracking and keeps the belt constantly in position. The machine is the BADER Polisher, shown with the "Jet" head, which permits the finishing of deep, short-radius contours and fillets, and also allows plenty of clearance for projecting parts of the work.

BEHR-MANNING®

BEHR-MANNING

CORPORATION

division of NORTON Company

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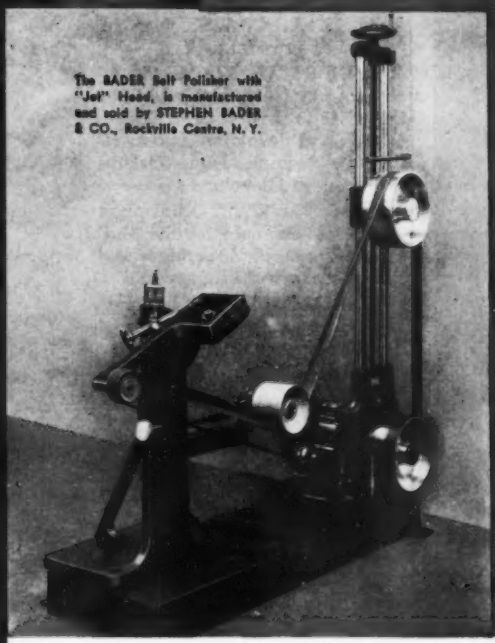
new in belt polishing

NEVER A DULL MOMENT . . .

New equipment and new applications are constantly appearing. Here's how you can keep up with them.

BEHR-MANNING Engineers watch these developments . . . try them out . . . cooperate in working out improvements — and also initiate ideas of their own. When actual demonstration proves them of real value, your BEHR-MANNING Abrasives Engineer brings you the full story.



The BADER Belt Polisher with "Jet" Head, is manufactured and sold by STEPHEN BADER & CO., Rockville Centre, N. Y.

This is BEHR-MANNING'S service to industry—to save you time in watching for and developing new belt grinding and polishing procedures, and to show you how it would apply specifically to your operations and to your advantage. Use this service—check with your BEHR-MANNING Abrasives Engineer.

NEW INFORMATIVE PACKET

"Blueprints for Faster, Better Production" gives you a whole series of case studies on new methods and tested coated abrasive products. You'll find it interesting. Address Dept. PB-5.

COATED ABRASIVES
SHARPENING STONES
PRESSURE-SENSITIVE TAPES

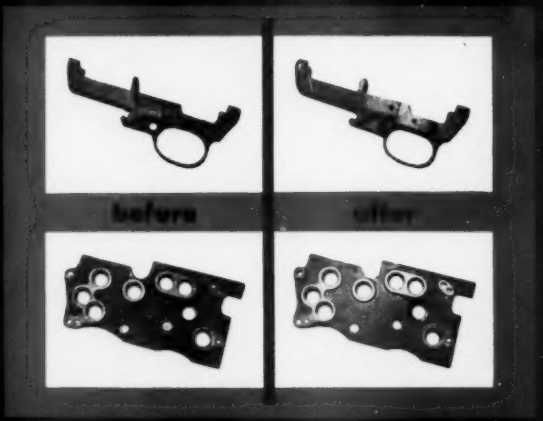
NORTON abrasives

Main Office and Plant, Troy, N. Y., U. S. A.
For Export:
NORTON BEHR-MANNING OVERSEAS INC.

ROTO FINISH

. . . gives you precision finishes in a *hurry!*

Still using hand methods for removing burrs and other surface imperfections on your precision parts? Then, investigate Roto-Finish, the fast, low-cost method of improving the surface of critical and diverse materials without disturbing precise dimensions. Send in your parts, please include a finished sample for a guide, to Roto-Finish's extensive laboratory for free analysis and recommendations. Let us prove how Roto-Finish lets you utilize your skilled labor more productively. There is no obligation.



get these benefits that only

ROTO-FINISH can give you . . .

- Saves you manpower and time by eliminating costly hand methods of deburring, descaling and surface improvement.
- Maintains *exact* tolerances on precision parts with no significant dimensional changes.
- Prepares raw forgings and castings for precision machining.
- Produces accurate radii on exposed edges and corners.
- Provides absolute uniformity on quantity lots.
- Removes burrs after precision finishes.

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Roto-Finish COMPANY

associated with The Sturgis Products Co.
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ORIGINATORS OF THE ROTO-FINISH PROCESS
For additional information Circle No. 97 on the Reader Service Card

PROMOTIONS AND APPOINTMENTS

Appointments announced by *Detrex Corp.* of Detroit, Mich., include: JOHN NUBER as assist chief engineer, STEWART MILLAR as supervisor of engineering standards, JOHN P. EMMETT as head of the newly created New Products Department, and P. S. MOEHLE as sales manager of national accounts.

DONALD L. TAYLOR as manager of general developments in the development and research department of *Hooker Electrochemical Co.*

CLINTON F. ROBINSON elected president and director of *The Carborundum Co.* to succeed H. K. CLARK who resigned as president.

ROBERT W. ELLMS as assistant chief engineer and TED HATCH as supervisor of the research and development department, Machine Div., *Osborn Mfg. Co.* of Cleveland.

JAMES M. WALTON as plant industrial engineer for the Midland Works of *Crucible Steel Co. of America*, Midland, Pa.

C. B. ALVORD to be merchandise manager of *United States Gypsum Company's* new Industrial Merchandising Department.

W. A. IRVINE, former works manager of Canadian General Electric Co., as manager of production engineering for *The Maytag Co.* of Newton, Iowa.

W. G. RAINEY as assistant manager of the Southern Div. of *The Diversey Corp.* He has been with Diversey nearly 15 years.

DR RALPH G. OWENS as dean of engineering at *Illinois Institute of Technology* to replace Dr. John T. Rettaliata who was recently named president.

WILLIAM H. GIBBONS as advertising manager of *Tinnerman Products, Inc.* of Cleveland, Ohio.

PMM USEFUL LITERATURE

For additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage is required.

PROCESSES

Wide Range of Die Castings: No. 144

Die castings ranging from name plates to surveying instruments, and the facilities which produce them, are presented in a folder from Advance Tool & Die Casting Co. of Milwaukee. Besides plant photos and descriptions, the folder also includes tabulation of composition and average physical properties of zinc and aluminum die casting alloys.

Investment Castings in Beryllium Copper: No. 145

A one-page data sheet on the use of beryllium copper for investment castings is available from The Beryllium Corp. A review of characteristics of the 2% beryllium alloy for investment casting, plus sections on design data, heat treating and surface finishing are included, along with brief case histories of a rifle breech bolt, rifle peep sight and business machine part.

Complete Die Casting Plus Finishing Facilities: No. 146

A photographic tour of the Middleville Engineering & Mfg. Co. is the subject of a 22-page booklet which takes in every department of the company's plant for producing and finishing die castings. The brochure includes the engineering department, tool room, die casting department and administrative offices, as well as departments for trimming, polishing, plating, packing and shipping. Three pages of die castings manufactured by the company for the automotive, plumbing and other industries are included.

How to Use Aluminum—an Index: No. 147

A new index published by Reynolds Metals Co. lists technical literature and motion pictures which the company has available concerning the effective use of aluminum. Technical literature is listed under five different headings covering design, fabrication, application, products and general information. In addition 7 motion pictures are available.

Recommended Die Casting Alloys: No. 148

Included in a brochure from The Anstice Company of Rochester, N. Y., producers of zinc and aluminum die castings, are recommended die casting alloys and their properties. The brochure also contains die casting design information and a review of company facilities.

Advantages of Investment Castings: No. 149

From Engineered Precision Casting Co. is available an illustrated folder telling some of the advantages of investment casting, and showing examples of such castings in ferrous and nonferrous alloys.

Tabulated Information on Non-Ferrous Alloys: No. 150

Zinc and aluminum die casting alloys, as well as standard brass, bronze, nickel silver, aluminum bronze and manganese bronze alloys, are reviewed in 8 pages of tabulated data in the December issue of Lavingot published by R. Lavin & Sons, Inc.

Die Casting Research Department: No. 151

The 10-man research and development division of the Doehler-Jarvis Corp. is introduced in a folder which shows a photograph of each man and tells the background and experience of each. The folder is issued as an invitation to friends and customers to make use of the research and development division which has recently moved into new quarters in Toledo, Ohio.

MATERIALS AND EQUIPMENT

Die Casting Machine with Self-Compensating Clamp: No. 152

A self-compensating toggle clamp to take up clearances in dies due to expansion or contraction of the molds during production or shutdown, is a special feature of a new series of die casting machines manufactured by Lake Erie Engineering Corp. A folder just received describes patented features of these machines and gives specifications.

Handbook on Carbonly Iron Powders: No. 153

Intended as a guide for using carbonyl iron powders, a new handbook pubished by Antara Chemicals, Div. of General Dyestuffs Corp., gives full engineering data, photomicrographs, charts, ca'culations, properties and a complete bibliography. This should prove a valuable reference piece for the user or potential user of iron powders.

Specialists in Producing Die Casting Dies, Plastic Molds, Hobs: No. 154

A company which has specialized in the building of die casting dies and plastic molds has issued a new folder showing some of the dies it has built, some of the parts produced from their dies, and a photographic review of its facilities. The Parker Stamp Works, Inc., of Hartford, Conn., has issued a folder, "Molds and Dies by Parker" which introduces company facilities for plastic molds, die casting dies, hydraulic hobbing, tracer controlled machining and complete engineering facilities.

More Accurate Screening of Metal Powders: No. 155

Equipment for screening and grading granular or powdered materials with extremely close accuracy is presented in a folder from Exolon Co. of Tonawanda, N. Y. The equipment, designed originally for the company's own use in grading abrasive materials, has now been made available to industry in general. Illustrations, typical specifications, report on principle of operation and a reveiw of performance are concluded.

Guide to Spark Testing Tool & Die Steels: No. 156

An unusual 20-page reference manual entitled, "A Simplified Guide for Spark Testing Tool and Die Steels," has been released by The Carpenter Steel Company of Reading, Pa. The booklet not only tells how to prepare for the test and reviews the way various elements affect the spark pattern, but gives elaborately detailed diagrams of spark patterns with an analysis of each.

Applications of Dissociated Ammonia: No. 157

A booklet, "Applications of Dissociated Ammonia," available from Armour Ammonia Div. of Armour & Co., will be of interest to powder metal fabricators and other metal working facilities employing controlled atmospheres.

Typical Furnace Installations—Gas-Fired, Oil-Fired or Electric: No. 158

Production furnaces of many types are well illustrated in a folder from The Electric Furnace Company, showing typical installations of gas-fired, oil-fired and electric units which they have designed and installed. Some 30 types of furnaces are listed, along with type of work for which they are intended.

For additional information Circle No. 91 on the Reader Service Card

what is?

Color Test

Color-Test is a method of inspecting parts to

LOCATE CRACKS, FLAWS OR POROSITY IN ANY METAL ANYWHERE, ANYTIME IN THE PLANT...IN THE FIELD!

K&W

Color-Test is economical and easy to use.

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SEND TODAY FOR COMPLETE INFORMATION FREE!

This new FREE booklet tells how two new types of Oakite-developed solvent detergents make it easier and cheaper for you to do many difficult metal-cleaning jobs. Here are some of the subjects covered in the booklet:

Cleaning metal between processing operations
Precleaning before painting or plating
Stripping paint
Providing temporary protection against rust
How to use Oakite solvent detergents:
Spray-washing machine method **Spray-rinse method**
Soak-tank method **Manual method**

FREE For a copy of this 24-page booklet (illustrated with photographs and diagrams), write Oakite Products, Inc., 34G Rector St., New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

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Hydraulic Power Unit Catalog: No. 159

In a new catalog from Rivett Lathe & Grinder, Inc., are included a line of hydraulic power units in single pump, double pump and combination pump types. The catalog lists all information necessary for efficient pump performance, gives working drawings and specifications, and contains a chart of maximum pressures at given HP along with HP requirements at given pressures.

FINISHING

Pointers for Washing Metal Parts by Machine: No. 160

The title of a new booklet offered by Oakite Products, Inc., is "8 Things to Look for When You Wash Metal by Machine." This compact little publication discusses in detail each of the eight points referred to and describes specific materials designed for use in metal-washing machines.

Use of High Speed Steel Tools on Aluminum & Magnesium: No. 161

In Vol. 3, No. 1 of "Ford Filings," published by the M. A. Ford Mfg. Co., there is a report on recent on-the-job tests of Ford high speed steel tools on aluminum and magnesium applications. Contains ideas for cutting costs and inventories, and also shows recommended operating speeds.

High Speed Tapping Heads: No. 162

A 2-color brochure from Procunier Safety Chuck Company gives complete data concerning its high speed tapping heads. The brochure includes photos, cross-section diagrams and charts, along with production information.

Steps in Selecting Industrial Heating Equipment: No. 163

A new 16-page brochure contains reference information on industrial heating problems and tells how Jensen Pan-L-Heat ovens may be used to reduce process heating costs. A helpful table included has the title, "Steps in Selecting Industrial Heating Equipment," including never-before-published data. Issued by Jensen Specialties, Inc. of Detroit.

Adjustable Multiple-Spindle Drilling Head: No. 164

Information is available concerning fully adjustable drilling heads which can drill on squares, rectangles, circles, triangles and irregular patterns. Produced by the Errington Mechanical Laboratory of New York, these drill heads are made with 3, 4 and 6 spindles.

Painting Machine Uses Electroformed Masks: No. 165

Semi-automatic painting of small parts having detailed painting and masking, is accomplished by a new type spray painting machine using electroformed masks. A technical data sheet from Conforming Matrix Corp. of Toledo explains the machine which paints and cycles automatically to the desired speed, requiring the operator only to insert parts in the masks and remove them after painting.

Handbook on Barrel Finishing: No. 166

A 56-page handbook on barrel finishing published by The Norton Company gives full data on this process for removing burrs, flash and sharp edges as well as polishing and burnishing before plating. Abrasives, grit sizes, barrel-finishing factors, equipment, processing and handling are among subjects covered. Enough basic data is provided to serve as a guide for setting up a department.

Detecting Cracks, Pores, Cold Shuts in Metal: No. 167

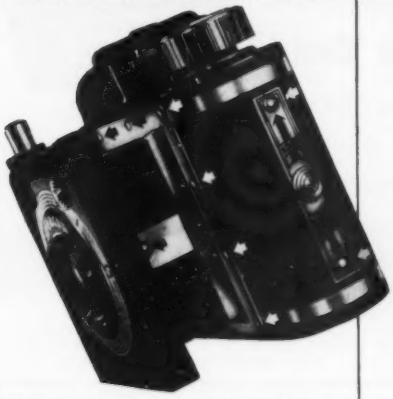
A penetrant dye process reported to involve two solutions, a dye and developer, is announced in literature from Met-L-Check Company of Hawthorne, Cal. Detects cracks, pores and cold shuts and can be installed without fees or license.

How to Store Coated Abrasives: No. 168

Best way to store abrasive belts and discs to prevent deterioration and improve length of service is the subject of a handy leaflet distributed free by Coated Abrasives Div. of Armour and Co.

This man can show you . . .

How to eliminate needless operations that slow up assembly hands



Because no tapping or inserts in plastic parts slowed production of this camera, assembly costs were greatly reduced. Sixteen P-K Type U Drive Screws were pressed into blind, untapped holes to assemble sheet metal and Bakelite parts. Two P-K Type Z Screws fasten the periscope extension box.

Type U Hardened Drive Screw, one of five standard types of P-K Screws. For permanent fastenings in castings, heavy gauge sheet metal, and plastics.

Ask a P-K Assembly Engineer to help you "question every fastening". He'll show you where tapping for machine screws, inserts in plastics, and awkward bolting or riveting are wasting time, boosting costs.

His experience is based on more than a million P-K applications. He can quickly determine which Self-tapping Screw, from Parker-Kalon's complete line of *standard* types, will help you make better, faster, stronger assemblies, at lower cost.

Today, more than ever, the P-K Assembly Engineer is a good man to have on your production team, helping you boost output and beat the squeeze on profits. He'll call at your request. Parker-Kalon Corporation, 200 Varick St., New York 14.

Your INDUSTRIAL SUPPLY DISTRIBUTOR . . . *your local source for P-K Screws—works side by side with the P-K Assembly Engineer. Their combined efforts are solving many difficult problems of planning and procurement. Let them help you.*

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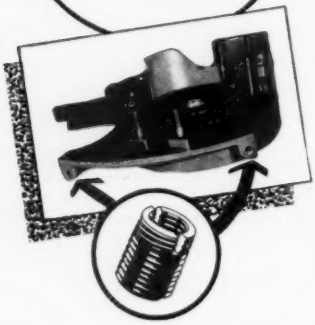
The Original **SELF-TAPPING SCREWS**

FOR EVERY METAL AND PLASTIC ASSEMBLY

For additional information circle No. 95 on the Reader Service Card

TAP-LOK INSERTS

strengthen power tools-- Chain Saws, for instance



THIS magnesium die cast housing is part of the Chain Saw manufactured by Homelite Corporation. Such tools must be strong in every part to withstand rigorous

To strengthen the tapped threads indicated by arrows, Homelite uses Tap-Lok Inserts. They report that the Insert not only provides a dependable non-stripping fastening, but also acts as a lock on the screw, preventing it from vibrating loose during use.

The unique self-tapping feature of this hardened steel bushing also substantially reduces assembly costs by eliminating a separate tapping operation.

Send for samples and descriptive folder.

•

Also manufacturers of Groov-Pins—for positive locking press fit.

GROOV-PIN

CORPORATION

1122 Hendricks Causeway
Ridgefield, N. J.

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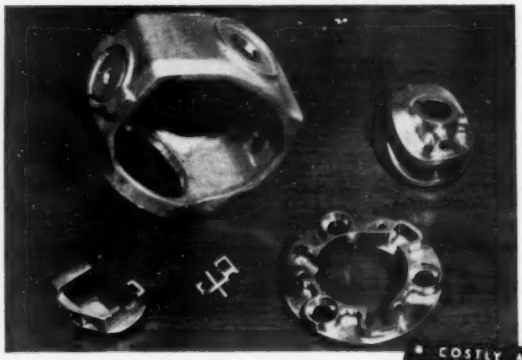

Scale ½"=1⅛ App.

Machined? or Cast?

• COSTLY MACHINING OPERATIONS WERE COMPLETELY ELIMINATED BY CASTING THESE PARTS BY THE "LOST WAX PROCESS"

PRECISION INVESTMENT CASTINGS

- cast centrifugally
- models and molds made by us
- non-ferrous only
- sample delivery three weeks from receipt of order

Send blueprints or samples to Home Office for prompt quotations.

Z & H MFG. CORP.

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LOCAL SALES OFFICES:

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Jackson-Walker Co. 2027 Arch St., Philadelphia, Pa.
Robert L. Thomson 77 South St., Stamford, Conn.

YOU KNOW THAT NO-WELD LICKS JOBS TOO TOUGH FOR OTHER LUBRICANTS; BUT HAVE YOU SEEN HOW MANY MORE CASTINGS NO-WELD GIVES YOU PER LUBRICATION DOLLAR ON ALL JOBS?

INVEST 3c to request a pint sample of NO-WELD so you can find out how economical NO-WELD really is.

NO WELD

Compound

THE

DIE LUBRICANT CONCENTRATE

SETTING NEW STANDARDS

for

ALUMINUM
MAGNESIUM
ZINC
DIE CASTING

E. M. SCOTT Chemical Company

241 West Jefferson Blvd., Los Angeles 7, California

For additional information circle No. 73 on the Reader Service Card

REFERENCE MATERIAL, catalogs and data free in this month's ads {circle numbers on reader service card.}

13. DIE CASTING FOR DEFENSE is the subject of a booklet, "We're Geared for Your Defense Needs" from Advance Tool & Die Casting.

14. INFORMATION ON MELTING furnaces is available in a pamphlet from Ajax Engineering Co.

15. GETTING ON-GRADE ZINC die castings is assured by the Certified Zinc Alloy Plan described in literature from the American Die Casting Institute.

18. PLASTER MOLD CASTINGS BY Atlantic Casting & Engineering Co. are described in "Quality Precision Castings."

20. CRITICAL SURVEY OF PRECISION castings for industry is the title of a report issued by Arwood Precision Castings.

22. METAL-OF-THE-MONTH IS a resume of market news, etc. issued by Belmont Smelting & Refining Co.

33. SMALL DIE CASTINGS—a review of size, alloy and design limits in a folder from Gries Reproducer Corp.

35. ZINC ALLOY SUPPLIERS, Henning Bros. & Smith, offer a monthly house organ called The Henning Messenger.

41. PRESSES FOR POWDER METALlurgy are the subject of a complete catalog from Kux Machine Co.

43. HOW TO DESIGN ALUMINUM and magnesium die castings is the subject of a data book from Litemetal Dicast.

45. HYDRAULIC OIL FILTERS produced by Marvel Engineering are presented in a data sheet.

47. SPECS FOR CAST-MASTER die casting machines are presented in a catalog from Cast-Master, Inc.

48. MELTING EQUIPMENT: ladles, ingot molds, kettles, compounds, etc. in a catalog from C. H. Milles.

50. FACTS ON PERMANENT MOLD and die cast parts are offered in a Fact File from Monarch Aluminum.

55. DIMENSIONING DIE CASTINGS is the subject of a guide book from Newton-New Haven Co.

56. WHY INDUCTION MELTING is best for ferrous or non-ferrous investment castings is explained in literature from Ohio Crankshaft.

61. INVESTMENT MATERIALS are included in information and price lists from Pre-Vest.

64. AUTOMATIC SHOT CONTROL for die casting zinc or aluminum is subject of a technical bulletin from Ring Valve Co.

65. NEW DIE CASTING PROCESS for producing aluminum & magnesium castings faster is introduced in a bulletin from Reed-Prentice.

73. PINT SAMPLE OF DIE lubricant for die casting can be obtained by writing direct to E. W. Scott.

74. TILTING FURNACES for aluminum and magnesium are the subject of Bulletin 100 from Stroman Furnace & Engineering.

77. ALUMINUM ALLOY SELECTOR to aid in analysis of foundry problems is offered by U. S. Reduction Co.

80. BARREL FINISHING methods are described in a manual from Abbott Ball.

81. FILLING ENAMEL in recessed designs or lettering is described in literature from Acromark Co.

82. BARREL FINISHING is discussed in 3 booklets from Almo Div. devoted to the process, the abrasives and equipment.

83. IRIDITE FOR PROTECTING metal surfaces is described in literature from Allied Research.

DEPENDABLE
BETTER METHODS
SUPER CAST
DIE CASTINGS
BETTER DIE CASTINGS
SINCE 1919

The meaning of a signature!

Through a quarter of a century of knowing how, the SUPER CAST reputation for Better Methods—Better Die Castings, has been recognized.

Sound engineering, metallurgical knowledge and skilled techniques have achieved and maintained a standard of superior quality.

SUPER CAST has kept faith, always deserving the mark it bears. SUPER CAST means die castings for those who want the best.

A sound, time-tested institution and a sound time-tested product have won confidence and widespread endorsement.

DEPENDABLE
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SINCE 1919

THE SUPERIOR DIE CASTING COMPANY
1001 London Road CLEVELAND 10, OHIO

For additional information Circle No. 71 on the Reader Service Card

84. ABRASIVE FINISHING methods are introduced in "Blueprints for Faster, Better Production" from Behr-Manning.

86. PAINT SPRAY MASKS and equipment for washing them are the subjects of literature from Conforming Matrix.

87. PREVENTION OF BLISTERING on plated zinc die castings by using an electrocleaner is covered in booklet from Diversey Corp.

88. BUILT-IN CONTROLS are feature of drill heads described in literature from Dumore.

89. BUFFS, COMPOUNDS and buffing equipment are included in catalog from Formax.

90. SCREW THREAD INSERTS for use in die cast metals are subject of data-sheet from Groov-Pin.

92. BARREL FINISHING system is outlined in a publication from Minnesota Mining & Mfg.

93. DEBURRING TOOLS which reduce production costs are described by NoBur Mfg.

94. SOLVENT DETERGENTS are covered in a booklet from Oakite.

95. LIQUID ABRASIVE BLAST finishing techniques are introduced by Pangborn.

97. ROTO-FINISH METHOD of barrel finishing is explained in manual from Roto-Finish Corp.

PMM INDUSTRY NEWS

TITAN METAL HEAD GETS ASM AWARD

The Penn State chapter of the American Society for Metals has announced selection of William Wetzel Sieg as 1952 recipient of the David Ford McFarland Award.

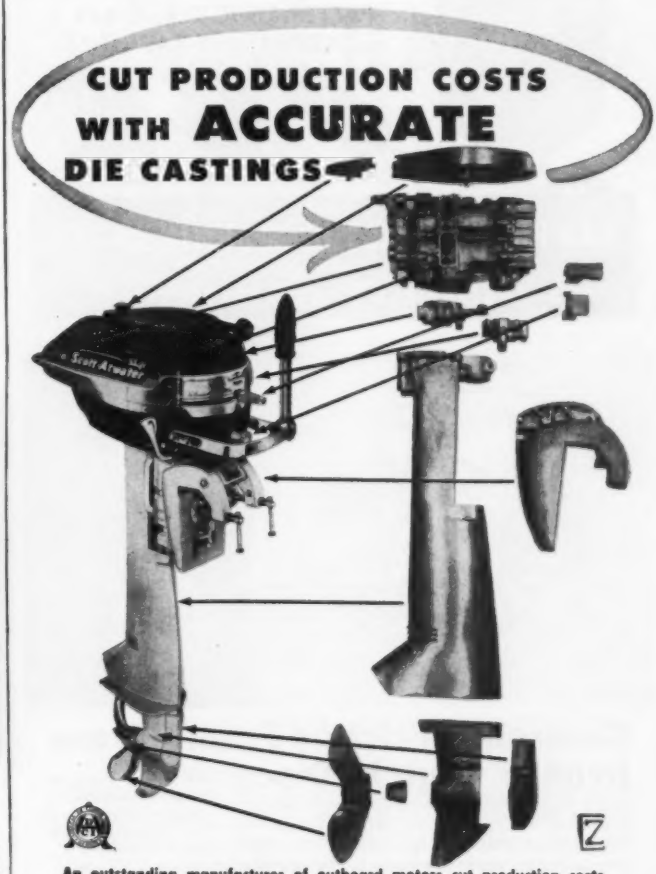
President of the Titan Metal Manufacturing Company, Sieg received the award at a dinner meeting April 25, 1952 at State College. The award was established in 1949 as an annual recognition to a metallurgy alumnus of the Pennsylvania State College. Mr. Sieg's selection was based upon his attainments in a metallurgical industry and outstanding work in civic affairs.

Mr. Sieg received the Bachelor of Science degree in metallurgical engineering at Penn

William W. Sieg

State in 1923 and the Master of Science degree in 1925. Prior to his present company connection, he was employed by the Ingersoll Rand Company at Philipsburg, N. J., and the Revere Brass & Copper Company, Rome, N. Y., as a metallurgist.

In 1929 he joined the Titan Metal Manufacturing Company at Bellefonte, Pa., and was appointed to the board of directors in 1934. He became vice-president and general manager in 1936, and president in 1948. He is a member of the board of directors of Consolidated Coppermines Corporation, the Bellefonte Trust Company and Copper & Brass Research Association



An outstanding manufacturer of outboard motors cut production costs and improved his product with dependable Accurate die castings. Accurate can help you make important savings by decreasing your material and labor costs with clean, ready-to-assemble castings. Write today for prompt service.

ALUMINUM • ZINC • MAGNESIUM DIE CASTINGS

ACCURATE DIE CASTING CO.

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For additional information Circle No. 34 on the Reader Service Card

Better CASTINGS

(NON-FERROUS)

SAND CASTINGS
PERMANENT MOLD
DIE CASTINGS

Hampden Brass & Aluminum Co. is fully equipped to handle all casting problems — from engineering to finished casting.

PATTERN SHOP • X-RAY & LABORATORY FACILITIES

PRESSURE CASTINGS • HEAT TREATING

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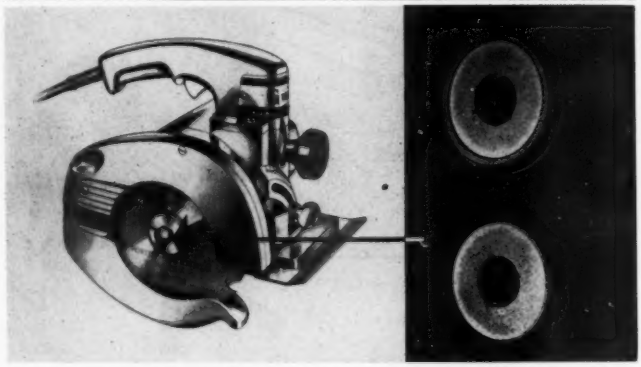
INCORPORATED 1903

SPRINGFIELD 1, MASSACHUSETTS



Controlled Friction From Porous Bronze Clutch Discs

makes Porter-Cable Machine Company's new circular saw the safest in the world. To get the exact friction properties they need, Porter-Cable uses a clutch plate produced by International Powder Metallurgy Co. from powdered bronze, impregnated with special lubricant. Perhaps you can get the specific properties your product needs by means of an IPM powdered metal component. Check with us.

The Powder Metallurgy Engineers Handbook is available to you. Send for a copy on your company's letterhead.

IPM

International Powder Metallurgy Co.

439 W. MAIN STREET • RIDGWAY, PENNSYLVANIA

For additional information Circle No. 38 on the Reader Service Card

SINTERING APPARATUS DONATED ILLINOIS TECH

A laboratory type sintering machine has been donated to Armour Research Foundation of Illinois Institute of Technology by Duncan Foundry and Machine Works, Alton, Ill.

Valued at $6,600, the machine is a pilot plant model. It will be used for studies of lightweight aggregates for concrete and the treatment of finely divided ores.

Dr. Einar P. Flint chairman of the Foundation's ceramics and minerals research department, said the machine will be a valuable addition to present laboratory facilities. The Foundation has been active in the development of improved concrete aggregates.

The American Ore Reclamation Co., Chicago, assisted in arrangements for the donation of the sintering machine.

TITANIUM CO. OF AMERICA FORMED BY CHRISTIANSEN

Edward S. Christiansen, president of Christiansen Corporation, Chicago producer of aluminum and magnesium alloy ingot and other products for the foundry, today (Wednesday) announced the formation of a wholly-owned subsidiary named Titanium Company of America. This corporation, chartered in Delaware, plans the construction of facilities for the manufacture of wrought products for industrial and military markets from the new metal titanium, said Mr. Christiansen.

Christiansen Corporation also is the parent company of three other wholly-owned subsidiaries devoted to the light metals industry. They are Magnesium Company of America, the country's largest fabricator of wrought magnesium products, East Chicago, Indiana; Alumicast Corporation, manufacturer of aluminum and magnesium permanent mold castings and die castings, Chicago, and Industrial Smelting Corporation, Chicago Heights, Illinois.

It is expected that Titanium Company of America's plant will

be located on the 30 acre property in East Chicago where Magnesium Company of America has headquarters.

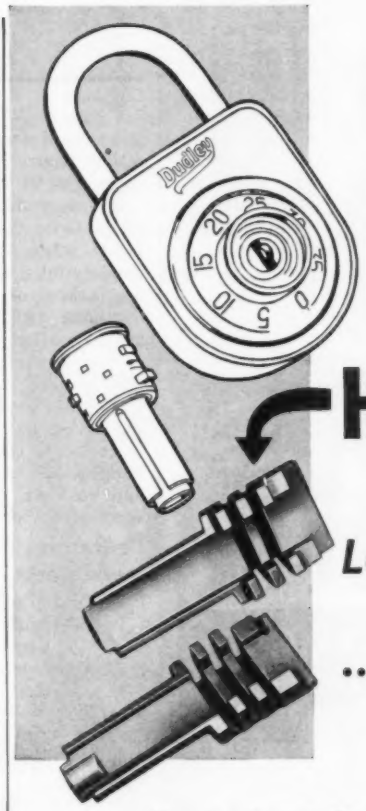
"The addition of Titanium Company of America," said Mr. Christiansen, "is in accord with the plans of Christiansen Corporation to meet and better serve industrial and military requirements in the light metals industry.

"Today our companies are serving the key industries with aluminum and magnesium products in both cast and wrought form. Continually mounting demand for light metal products and applications in the automotive, aircraft, electrical equipment, machinery, marine, and materials handling industries—to mention a few—spells out the vital necessity for titanium development as well as presaging a bright future for this newest of the light modern metals."

Titanium properly is classified as a "light metal," said Mr. Christiansen. It bridges the gap in many ways between aluminum and/or magnesium and steel. Titanium is 150 per cent heavier than magnesium. 60 per cent heavier than aluminum, but only 56 per cent as heavy as alloy steel.

The tensile strength of titanium tops that of many steel alloys. Its high temperature properties are far superior to those of aluminum. Titanium's resistance to corrosion is unexcelled by any other structural metal. It is the fourth most plentiful metal in the earth's crust. While availability still is severely limited, output rose from 100 tons in 1950 to more than 700 tons last year. Tonnage use of the metal is expected to become a reality in the next five to ten years.

Some technical problems still exist for titanium. The researchers, however, are confident they will be solved.



DIE CAST PLUG-HALVES

Simplify Lock-Cylinder Assembly ...Eliminate Costly Operations

The zinc die-cast plug-halves, pictured here, are delivered complete, ready for use, to the Clum Mfg. Co. where the lock mechanism is assembled. The tumbler slots, all grooves and shoulders are accurately cast, require no machining, and fit together perfectly to form the cylinder which contains the delicate lock mechanism. Dimensions must be held to extremely close tolerances in casting two halves to make one diameter.

Before these plug halves were die-cast, they were made of a costlier metal by the extrusion process. A number of precision machine operations were required to prepare them for assembly, and considerable hand work was often required to achieve precision fit of the two halves. The cost of the lock-cylinder sub-assembly has been reduced substantially by die casting the plug halves.

This example should suggest that precision die castings, by MILWAUKEE, may be the answer to one of your design, cost, or production problems.

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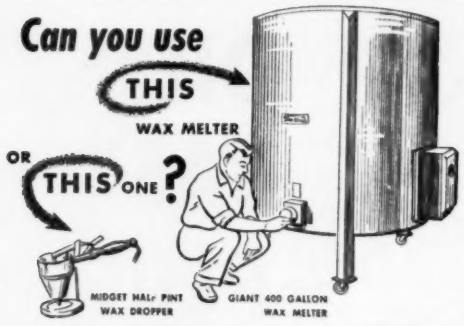

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b) Sta-Warm offers designing service to augment its line of standard melters. This service offers to engineer a "special" design just for you.

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HIGH DENSITY IRON POWDER
continued from page 42

and second sintering operations. When this condition occurs, they have found that the final properties of the part are invariably harmed.

The degradation of physical properties is believed to be due to rupture of the grain boundry bonds when excessive movement is required. Healing must then occur during the second sinter instead of all of the sintering time being available for the desired grain growth and recrystallization.

When a part is considered for production from iron powder, it must go through a fixed procedure before a final decision is made. This procedure has been set up so that a complete evaluation can be made before the part goes into production. While the various steps may seem long and needless, their worth has been proven by successful operation.

Procedure for processing powdered metal parts

1. *Tentative approval of part for powdered metal fabrication from a tooling angle by the planning department.*
2. *Approval from engineering department on material change and any design change*

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E. M. EHRBAR, SECRETARY
302 MAIN STREET
STAMFORD, CONNECTICUT
TELEPHONE 24000

January 24th, 1951

Mr. L. Ring, Pres.,
Ring Valve Company Incorporated,
Clawson, Michigan

Dear Mr. Ring:-

As a result of your Advertisement in Die Castings magazine, some of my Clients have asked that I check the merits of the Ring Automatic Shot Control Unit.

This I have done by writing some of my old friends in the industry, who have installed your Shot Control Unit on their equipment. The results of this inquiry have been so gratifying that a number of my Clients have installed your Shot Control Unit on their equipment, with the results that the Shot Control Unit does everything you claim for it.

You mention only surface finish in your Advertisement. While this can be attained with your Shot Control Unit, you overlook the other good feature, and that is, density. This is an important factor in all quality castings, however more important at the present time, is that Government Specifications on all components used by them in the last War clearly called for density even to a point of use of the X-Ray to determine density.

I wish, at this time, to compliment you for bringing this Shot Control Unit on the market. The Industry as a whole are ever trying to improve on the castings produced by them. Your Shot Control Unit goes a long way in making progress possible.

I wish you every success.

Sincerely yours,
EHRCO DIE CASTING SERVICE
John R. Ehrbar
John R. Ehrbar

JRE:tme

RING VALVE CO., Inc.
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Telephone LIncoln 2-3387

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PROVIDES 2 STAGE CONTROL OF THE INJECTION STROKE

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necessary for improved tool characteristics.

3. Approval from the metallurgical laboratory for functional use of part.
4. Estimate cost of powdered metal production and compare with present cost to determine if savings is possible. (Other conditions, such as upkeep of present tools or inferior quality of parts may outweigh a lack of savings in processing.)
5. Estimate tool cost.
6. Present all figures to tool supervisor for final decision.
7. Issue tool order (Specify type of tool, amount and type of punches, core rods and type of press to be used.)
8. Consult with designer and approve design.
9. Obtain blue prints from toolmaking department and send out for quotation.
10. Get final approval on price from tool supervisor and have purchase order issued to make tool.
11. Try out tool when received and submit samples to the metallurgical laboratory for approval.
12. Work with the metallurgical laboratory on problems arising from density, porosity, tensile strength and impact strength characteristics. Sizing operations or an alloy may be needed to improve any of the above qualities, or also, machineablity at future operations. Make tryouts for the metallurgical laboratory until the correct blend and machine process is arrived at.
13. Have a life test run on all parts by the product testing department when required by the metallurgical laboratory.
14. Submit tools and approved sample parts to the tool inspection department for dimensional check.
15. Write engineering change request to the engineering department to change the material to powdered metal and make any design or specification changes needed.
16. List part for powdered metal. Specify material, number of pieces per pound, blend number if any, type of machine required, operational routing and all tools and gages required.
17. Request a trial lot order from stock ordering for the purpose of studying actual operation conditions. Copies of this letter will be sent to all individuals concerned as a notification that the tools are completed and ready for production. The metallurgical laboratory will then issue a process specification for the powder metal mix applicable to the part, as previously determined in Item 12 above.

It will be noted in the above that tooling is one of the major

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items considered. There has been, and unfortunately still is a wide-spread belief in the powder metallurgy industry, that the use of high forming pressures and short die life are practically synonymous. Only cemented carbide dies are used. These dies are fitted with steel core rods and punches. For the punches a high carbon, high chromium steel is generally used, hardened to about 58 Rockwell C, or a double vanadium high speed steel such as Vascoloy Supreme. The core rods are generally the same steel tipped with carbide so that all wearing surfaces in contact with the powders are carbide. No taper is provided on the core rods and holes as small as 1/16 inch in diameter have been cored. The minimum size hole that can be made is not known.

The carbide dies are made by the Micro Carbide Tool & Die Company of Indianapolis, Ind.

Thus far, not a single carbide

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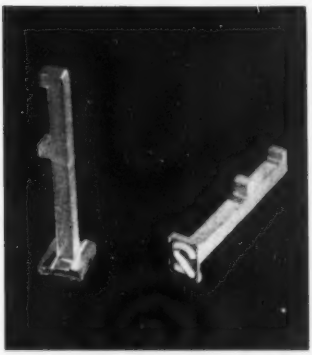
die has been worn out, and in fact, after over four and one-half million pieces had been made on one die, there was only 0.0001 wear. With die life such as this, the original high cost of the dies is easily justified.

As a powder and die lubricant, ½ of 1 percent of stearic acid is mixed with the powder. No other lubricant of any sort is used on those pieces that do not need any final machining. In the cases of parts that must have machining done on them such milling, drilling or threading, it is customary to mix a small amount of molybdenum sulfide and graphite with the powder. This admixture prevents the formation of a heavy burr during machining.



AN UNUSUAL PART made from iron powder. This type bar is pressed to shape and the number or letter formed on the face through the use of a side slide in the die. This requires simultaneous application of pressure from two directions at right angles to each other. This is one of the procedures developed at NCR that has been considered impossible in powder metallurgy.

All coining is done without the use of added lubricants and machining follows standard shop practice.

With this necessarily brief review of the processing procedures used, it is of interest to examine in more detail a typical part being made from iron powder. The counter pinion shown in Figure 3 has been chosen as fairly typical. It is, of course, a high density part and represents a case where powder metallurgy has replaced blanking, shaving and machining as a fabricating method. In addition, this pinion is subjected to a very considerable impact load, a service rarely recommended for parts made from metal powders.

Comparing first the steps required to produce the pinion by both methods of fabricating (See Figure), it is at once apparent that the use of powder metallurgy has reduced the number of operations from 20 to 12 and the number of inspections from 7 to 5. The entire piece is case carburized to a depth of 0.015 and then hardened and tempered to give a final hardness of 40 Rockwell C. The one long tooth is then re-hardened inductively to 62 Rockwell C.

Since the impact properties of the pinion are of paramount importance, testing, other than hardness, is confined to an impact test. This pinion, when made

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from SAE 1010 punching stock and then hardened, has an impact strength for the long tooth of about 4½ inch pounds. The pinion made from iron powder has an impact strength on the corresponding tooth of from 10 to 16 inch pounds, an improvement of some 2 to 3½ times.

Production costs by powder metallurgy are not yet finalized, but preliminary estimates show a manufacturing cost savings of 50-60 percent.

Other than the improved impact strength secured and the lower manufacturing cost, there are other advantages gained by the use of iron powder that are less tangible, but still vitally important. The reduction in number of operations has removed a heavy load from some machines allowing increased output of other parts that must be made on them. Blanking and forming dies were a continual source of trouble and

continued on page 76

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SIMPLIFIED SOLUTIONS

for production problems

METALLIC COMPOSITIONS UNOBTAINABLE by any other fabricating method can sometimes be procured through powder metallurgy. This is the primary reason for producing the circuit breaker arc runner, below, by this method to get a homogeneous, high density component from copper and tungsten. This piece, manufactured by Gibson Electric Co., of Pittsburgh has outstanding ability to withstand the effects of intense arcing with the interruption of short circuit currents by large circuit breakers. Conductivity of the material is 29% IACS, its density is 14.3 g/cc and hardness is Rockwell B-97. The shape of the piece is molded to close tolerances, but front and back surfaces need to be ground to meet extremely close limits on parallelism.

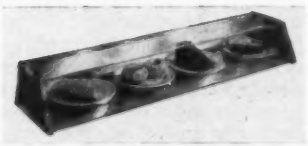
TO SECURE GOOD ANCHORAGE BETWEEN PLASTIC AND METAL it is generally necessary to knurl or otherwise roughen the metal surface or provide undercuts so that when the plastic is applied a firm bond will result. This is almost always an extra operation adding somewhat to the cost of the finished article.

One way in which many manufacturers are avoiding this extra cost is to make the metal insert whenever possible out of metal powders. For this use, the powder part is made quite porous (generally 30 to 40 percent porosity) so that the plastic while molten will impregnate the metal part and thus give a deep seated firm bond.

The brush holder shown is an example of this use of powder parts. The brass insert is sufficiently porous so that a sensible layer of metal must be removed to eliminate all of the plastic should that be desired.

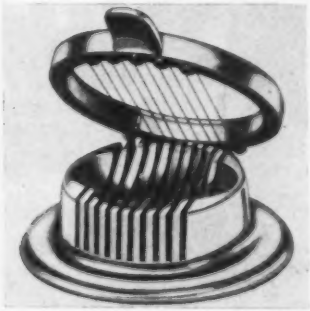
ABILITY TO TAKE A QUALITY FINISH often accounts for the use of die castings and permanent mold castings. Three good examples from the field of restaurant equipment are these three units produced by Bloomfield Mfg. Co. of Chicago.

1. End frames for a counter display case are die cast in zinc and given a copper-nickel-chrome plating cycle. Rigidity of these castings is good.



2. An aluminum permanent mold casting gives a smooth, easily-polished ice cream spade. A special alloy has been chosen for durability.

3. For ease of cleaning, this egg slicer is produced from smooth-surfaced zinc die castings which do not rust. They are given a protective nickel plate.



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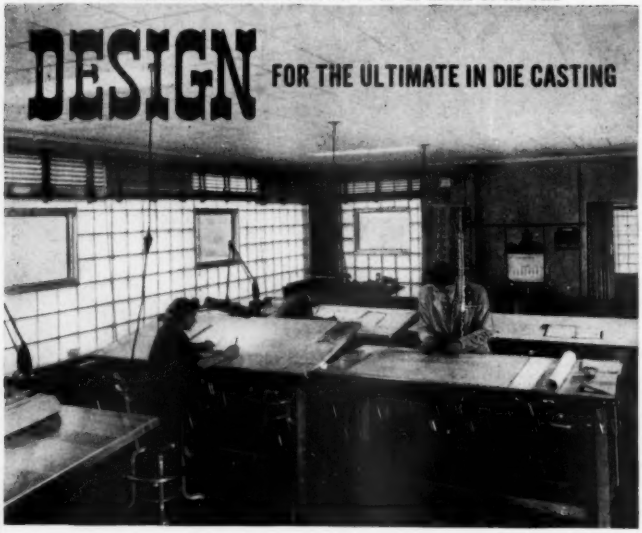

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expense. In order to keep production moving, it was necessary to have at least two sets of dies, one set in the machine and another set in the tool room being sharpened and dressed. Not only was this an expensive procedure, but placed an unnecessary burden on the tool room.

One of the most impressive gains made by conversion to powder metallurgy is shown in the inspection department. On a recent check, out of 200,000 counter pinions, only two were rejected. These were rejected because in each case a tooth had been broken off, presumably on the green compact, and not because of either physical properties failures or dimensional inaccuracies.

The reduction of the load on the inspection department brings up the question of dimensional accuracy and dimensional stability of parts made from iron powder. Most of the parts made, regardless of the method of fabrication, must be held to close tolerances. Normal machining operations are held to ± 0.001 or less. Absolutely no latitude is given to parts made from iron powder. They must have the same accuracy as a machined counter part. Experience thus far has indicated that the parts made from metal powders are more uniform than machined parts see Figure 6. Inspection has been reduced to an occasional spot check instead of the former routine inspection which ran from 25 to 100 percent of the pieces.

The reduction in inspection is another example of why only carbide dies are used. Even on the die referred to above on which over 4½ million pieces have been made, there has been insignificant wear.

Thus far, no mention has been made of the physical properties than can be achieved in these high density parts when physicals are measured in the more usual methods. Such properties as tensile and yield strength, reduction in area, elongation, mod-

ulus of elasticity, etc., are not determined as routine measurements. Standard test bars are made from time to time and tested, but it has not been possible to correlate the results obtained with the properties of the specific piece. As a result, tests are devised that measure the particular property of importance on the fabricated part.

Some tensile properties are known in a general way, but since no standardization has been achieved, the values determined are not quoted.

One type of testing that is carried out extensively is life testing. Before any part is accepted for manufacturing, it must pass life tests. This testing consists of putting the part through a sufficient number of cycles to give 50 to 100 percent more operations than can normally be expected when the machine is in service. Following this test, the machine is subjected to an accelerated life test in which both the load on the parts and the operating speed are increased from 15 to 25 percent. With this sort of testing as routine, it can be seen why any parts made from iron powder must have properties equal or superior to the properties of their wrought predecessors.

One other routine test is made on parts fabricated from iron powder. In the case of the counter pinion under discussion, the weight of the finished pinion is held between 5.35 to 5.40 grams. This is an allowable total variation of only 1 percent. Others are held more closely.

At the present time about thirty-five different parts are being made from iron powder. All of these parts are full density (about 99 percent of theoretical), all have properties equal to or superior to the properties of the part they replace and all of them represent a substantial reduction in cost.

These parts represent only the start at National Cash Register Co. The review of methods goes on continually to determine which other parts can best be made from iron powder.

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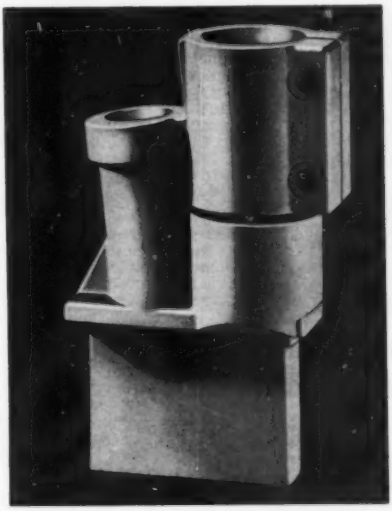

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ABSTRACTS OF PAPERS GIVEN AT METAL POWDER ASSOCIATION MEETINGS, APRIL 29-30, 1952*

Aspects of Powder Metallurgy in National Defense

Captain John D. Dale, Special Assistant to the Commanding Officer, Ordnance Corps, Frankford Arsenal, Philadelphia, Pennsylvania

While there is a vast application of powder metallurgy in the production of military equipment, discussion will be devoted primarily to Ordnance applications. The Sintered Iron Rotating Band Development Program was reviewed with an up-to-date summary of the status of the program. Development work and production activities in fuze components were summarized, and a review of small arms ammunition applications were made. In most cases a comparison was made with former methods of manufacture to illustrate the advantages which have been or which will have been obtained through the powder metallurgy technique.

Progress in Powder Metallurgy in Europe

W. D. Jones, M. Eng. Ph.D. F.I.M. Consultant Powder Metallurgist Director, Powder Metallurgy Ltd., London

The last few years have seen very rapid progress in powder metallurgy in Europe, not only in quantity of production, improved techniques, but also in quite new products. The author has recently completed a tour of powder metallurgy plants in Sweden, Holland, Germany, France, Italy, Spain, Portugal, and South Africa and gave an account of the more interesting developments in those countries and in Britain.

Julius J. Harwood

Powder Metallurgy in High-Temperature Applications

Julius J. Harwood, Deputy Head, Metallurgy Branch, Office of Naval Research, Washington, D. C.

Expanded production of jet engines and the development of new and improved gas turbines, guided missiles, and rockets are currently posing two serious materials problems: (1) the necessity of conservation of critical alloying elements, (2) the need for refractory materials capable of withstanding conditions of high temperatures and severe operating stresses. The role of powder metallurgy in assisting in the solution of these problems was discussed. Typical present and potential applications of powder metallurgy techniques and processes were presented.

Recent Practical Applications of Hot Pressing

Jerome F. Kuzmick, President, Welded Carbide Tool Company, Clifton, New Jersey

"Recent Practical Applications of Hot Pressing" covers hot pressing as applied to tungsten carbide, beryllium, heavy metals, diamond bits, etc.; possible uses of hot pressing for steel dies, high temperature alloys and cermets. Included discussion of types of presses and molds for hot pressing of metal powders.

*These papers will be published in full by the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. These can be purchased for $2.50 in bound form.

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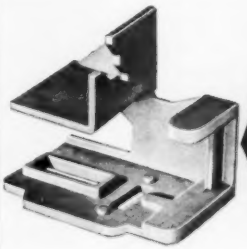

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Magnetic Powder Cores for Military Communication Equipment

By Eberhard Both

Signal Corps Engineering Laboratories, Ft. Monmouth, N. J.

The need for the development of improved magnetic powder cores for military communication equipment was demonstrated by comparing the characteristics of present materials with those required for the stable and dependable operation of the equipment under the extreme environmental conditions encountered in modern warfare.

Carbonyl Iron Powder

George O. Altman, Physicist, General Aniline & Film Corporation Grasselli, New Jersey

The structural characteristics of carbonyl iron powders were described and their relation to the electromagnetic properties of high-frequency cores containing these powders was discussed.

Electrolytic Iron Powder

W. M. Shafer, Plastic Metals Division National Radiator Co., Johnstown, Pa.

Electrolytic iron powder is a high purity material produced with a range of particle sizes and shapes suitable for a variety of magnetic core applications.

PRESSED STEEL TO DIE CAST

continued from page 34

A further advantage of a die cast housing is that part of the fan tilting device can be incorporated in the lower housing member as an integral part of the casting. This avoids a separate joining operation and gives a stronger assembly.

When fan hubs are formed of sheet steel the problem of balancing them becomes difficult. Further, any slight blow may bend a pressed steel hub rendering it useless. As a zinc die casting, Figure 3, these fan hubs can be balanced easily and quickly. Their inherent rigidity obviates the trouble caused by accidental blows and dropping and, when completely finished with the fan blades attached can be manufactured at substantially less than a comparable fan made by other methods.

The motor bracket, Figure 3. used in window ventilating and hassock types of fans was formerly made by welding a plurality of formed steel parts. Relatively complex jigs and fixtures were required to position the different pieces for welding and cracked welds after the fan had been in operation for some time were not uncommon. As a single zinc die casting all of the assembly problems have been eliminiated and thus far there has not been a single service failure.

The name plate and window mounting are two more die castings used by the Berns Mfg. Co.

Thus far, nothing has been said about the finishing operations used. The flash from the die casting operations is generally removed with grinders, both stationary and air operated hand held. Where necessary the castings are finished by hand filing and with sanding belts and discs. Tumbling, a common method of cleaning, can not be used on these parts since those small enough to be tumbled are mostly fan hubs and it has been found that the blade supports frequently bent so that the piece had to be rejected after fan had been assembled.

All parts are given a primer coat of paint and those parts such as motor housings, pedestals, and legs sprayed with air drying lacquer.

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Purchasing agent's specifications for ELECTROLYTIC IRON POWDER* used by National Cash Register Co.

Scope

This specification records the purchase requirements for Electrolytic Iron Powder for use in the manufacture of high strength iron parts by the Powdered Metal Process.

Material and workmanship

The powdered iron shall be of the highest grade in its particular classification. It shall be of the highest purity and free from any dirt or other contaminating materials.

Chemical analysis

The powder shall conform to the following chemical analysis:

	Minimum	Maximum
Iron	99.2%	
Other Impurities		0.1%
Hydrogen Loss	0.3%	0.7%

Samples for chemical analysis shall be taken at random from the various containers in each order so as to be representative of the entire lot.

Grain shape

The general grain shape shall be of the type known as sharp, which is an irregular shaped particle. There shall not be present, in any quantity sufficient to alter the powder characteristics, any particles having acicular, spherical, or flaky shapes.

Grain size distribution

Grain size distribution shall be controlled from the +100 mesh fraction and the −325 mesh fraction. The intermediate fractions will be controlled within satisfactory limits when those two separations fall within the specified limits.

A typical screen analysis is as follows:

+100 mesh	2.3%
−100 : +150 mesh	8.7%
−150 : +200	24.7%
−200 : +250 mesh	6.1%
−250 : +325 mesh	17.6%
−325 mesh	40.6%

Control limits for the +100 and −325 mesh fractions shall be as follows:

+100 mesh	0 to 3%
−325 mesh	40 to 50%

Procedure for analysis shall conform to the Metal Powder Association Specification 5-46T.

Hydrogen loss

Hydrogen loss shall be maintained at 0.7% maximum with a typical loss being between 0.3% and 0.7%.

Test for hydrogen loss shall be conducted according to the Metal Powder Association Specification 2-45T.

Flowability

Flowability shall be maintained within a range of 33 ±3 seconds per 50 gram sample.

Testing of the flow rate shall be done in accordonce with Metal Powder Association Specification 3-45T.

Apparent density

The apparent density shall be held to a range of 2.5 gms./cc ±1.0% and shall be determined as per the Metal Powder Association Specification 4-45T.

Compressibility or green density

A green density of 6.25 gms./cc minimum shall be developed by the powder under the following standard procedure:

1% zinc stearate will be blanded with the powder to act as a die lubricant and the powder pressed under a pressure of 60,000 psi. Density will be measured in the conventional manner of weighing in air and in water and computing it from the weights so obtained.

Sampling

Sampling of the powder for testing purposes shall be done in conformance to the Metal Powder Association Specification 1-45T.

Packing and marking

The powder shall be shipped in 3.5 gallon steel pails holding 100 lbs. of powder in each. The pails shall be of the conventional full open top type having a rubber gasketed crimp lug type of cover and with a wire bail for handling.

A lot number shall be assigned to each shipment and each pail shall be so marked as well as with a description of the contents, the name of the supplier and The National Cash Register Company's specification and purchase order numbers.

Terms of rejection and replacement

Material failing to meet the requirements of this specification will be rejected and returned to the manufacturer or dealer for replacement or full credit, at the option of the purchaser. The shipper is to pay the freight both ways on rejected material.

*See "National Cash Register Co.: Pioneers in High Density Iron Powder Parts" beginning on page 38.

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DESIGNER CHOOSES
continued from page 29

all times poised and ready to go.

After approval of the design, a clay model was made and tested for balance and comfort of the piston grip and trigger. After modifications, a working drawing was made, and from it a full scale wooden pattern.

The wooden pattern was made in two halves of the future die cast housing. Each half, with the parting plane down, was laid in an open mold, dusted with powdered graphite, and a casting of Cerromatrix. This alloy, obtained from the Cerro de Pasco Copper Corp., has the useful property of expanding .005 inches per inch as it hardens, a degree of expansion similar to the ratio by which zinc alloy shrinks when it hardens. Thus, by working from an inexpensive wooden model, a Cerromatrix pattern of the future die casting mold was obtained, with a

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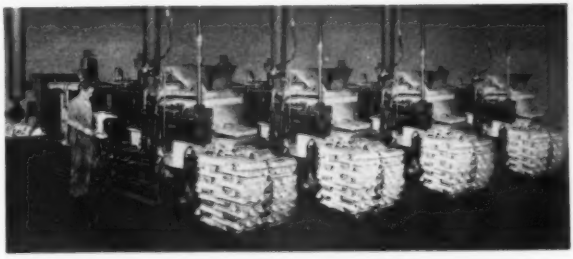
shrinkage allowance automatically provided.

A further advantage of the Cerromatrix pattern was that, being relatively hard, it could be traced with a simple attachment on a standard Bridgeport milling machine. Softer plasters, which are sometimes used, require expensive and uncommon electronic or hydraulic machines. Yet the Cerromatrix, which flows at 240 F., was as simple to cast as plaster.

After the cavities had been duplicated from the Cerromatrix masters into steel mold blocks, and filed and polished, wax impressions of the cavities were made. The wax impressions were then given out to an investment caster (Arwood Precision Castings Corp.) and castings of oil hardening steel were made from them. These castings became the cores of the molds. Shrinkage of wax and steel, plus machining, resulted in a space of about 0.50 between cavity and core, the future die cast wall thickness. The machining had to be done carefully because all the recesses, locating lugs, bosses, screw holes, etc., which had so laboriously been obtained previously by removing metal from each sand casting in Champion's old method, would now be transferred instantaneously from the mold by the die casting process.

The completed mold now casts the housing in the form of two thin shells, with all the locating and fastening projections and recesses cast as integral parts of the interiors. The two halves, which are almost mirror images, are degated, then flat sanded, so that each pair will fit tightly together. Alignment is positive since matching bosses and holes are cast into the two halves. After each pair is temporarily assembled, it is contour sanded, to give the appearance of a single unit. The housing is shipped as matched pairs, along with the trigger and spray ad-



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justing knob, which are cast simultaneously in a multiple cavity die with the housing, at a saving over being purchased, as they were previously, as separate parts. Using self-tapping screws, Champion assembles the guns without any machining.

After assembly, the guns are sprayed with a grey hammertype finish, then baked. Since the trademark, rating and other data are engraved into the mold, and stand out clearly on the casting there is no need for a separate nameplate.

Since the molds were completed, the die caster has supplied many thousands of castings for these guns. They serve in the home, making day-to-day tasks a little lighter; they also serve the armed forces where conventional compresser units are impractical. In either case, this device would never have achieved its present position without the help of die castings.

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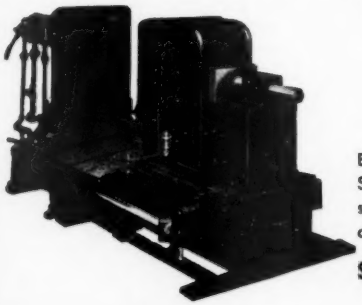

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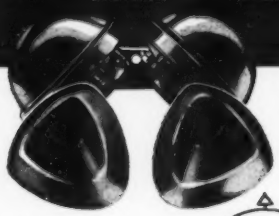

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TOOL STEEL INVESTMENT CASTINGS

continued from page 27

until it is clinched over the tensioned strap. Therefore, the bottom surface of the casting must be clean, smooth and unmarked by a parting line. The shape of the nib, which can be seen in the drawing, Figure 3, must be accurate and its edge sharp to engage the seal properly.

The designer has also specified that the parting line fall along the sides of the circular stem, and that the sprue be located anywhere on the heel surface of the casting. These directions prevent the use of the simplest—and least expensive—mold design which might be possible, but are essential from a mechanical viewpoint.

A particular problem was met in the circular groove around the top of the stem, intended as a seat for a snap ring. As originally designed, this groove was .008 deep. This permitted a seat deep enough to hold the snap ring without requiring excessive expansion to install the ring. It was found that the depth and sharpness of the groove could not be controlled accurately enough in casting, so that the ring would not always hold. It was then decided to cast the stem without the groove and machine it. This practice is still being followed, although experiments led to the replacement of the original

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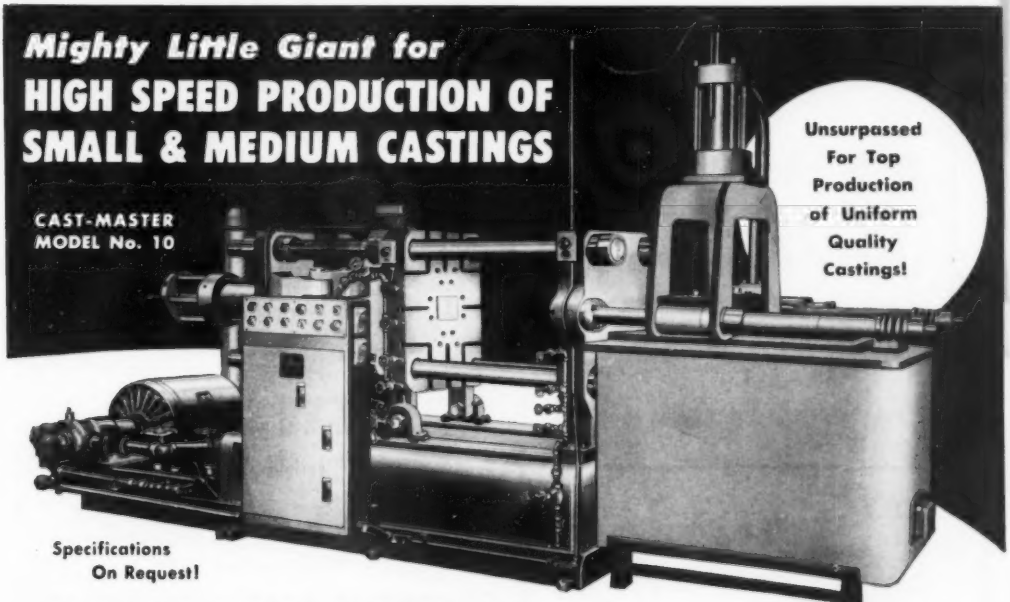

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type of snap ring with another which made possible an increase in depth of the ring groove. That groove is now machined to .025 in order to be certain of getting the required sharp inside and outside corners and accurate depth.

This small piece might be produced by stamping and coining, except for the difficulty involved in coining the round shank. Tooling for this type of coining would be too expensive and accuracy would be considerably lower than is possible by investment casting. Turning the snap ring groove is the only secondary operation required by the investment casting.

Another odd-shaped small part being investment cast for Acme Steel is the anvil for a quarter-inch crown steel stitcher, Figure 1c. This machine stitches metal sheets or plates in much the same way that lighter types of machines stitch paper or cardboard. The investment cast anvil is spring loaded, and pivots to hold the wire stitches after being cut off from a coil of wire and before being formed into the shape of staples.

This part is cast in a low carbon steel, AISI 8620, heat treated to Rockwell A 78-81. It is oil quenched and drawn and has a skin harness about .020. deep.

In parts such as this, it is not always possible to eliminate all secondary operations, but because of its odd shape, it is still much less expensive to investment cast than to machine it.

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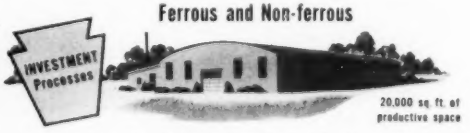

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Two holes must be drilled, reamed and burred, and the pieces are finished in a Roto-Finish barrel operation to take off sharp corners or burrs. The smallness and irregularity of the shape make tumbling most practical.

Several operations have been eliminated when a two-piece assembly was replaced by an investment cast clincher used in a book stitcher.

This little piece, measuring less than 3/4 inch in its longest dimension, was at one time assembled from a stamping and a small pin. A hole was drilled through the stamping and the pin was then pressed into it. One problem was a change in size of the hole during heat treating, and the necessity also for grinding the sides of the stamping for parallelism.

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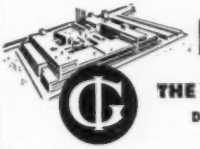

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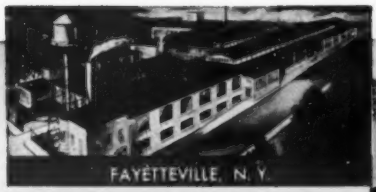

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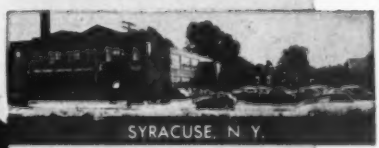

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